WORKSHOP ON WEANING FOODS

A REPORT

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the Andhra Pradesh
collaboration with th
Indian Council of Ag

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REPORT OF A WORKSHOP

ON

WEANING FOODS

Held at the College of Home Science,
Andhra Pradesh Agricultural University,
Hyderabad, July 1-2, 1983

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NOTE

In developing countries where breast-feeding is a common practice, it needs to be supported and encouraged by making people aware of its advantages and of the dangers of bottle feeding. Yet, a crucial contributing factor to the malnutrition of the infant is prolonged breast-feeding without appropriate introduction of complementary feeding. Besides, the time and type of complementary food varies from place to place and is based on cultural practices. It is with these basic considerations in mind that a "Workshop on Weaning Foods" was organized to collect information on the prevailing weaning practices in India, to identify the most desirable ones and to suggest ways and means of propagating them. It is hoped that the background material and the recommendations presented in this Workshop Report will be incorporated in the activities of those institutions and individuals most directly concerned so that malnutrition among infants, which is one of the prime causes of infant morbidity and mortality, can be considerably reduced.

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F O R E W O R D

A society realizes its development potential according to the level of physical and mental activity of its adult members. Early childhood constitutes the foundation of adult productivity and nutrition is a major determinant of the quality or strength of this foundation. In the vast biological stretch of early childhood, infancy is perhaps the most critical and vulnerable period. It is during this period that we witness a high incidence of wastage from mortality and morbidity due to many factors among which, in my view, some very important contributing factors are non-feeding of colostrum to the new-born, faulty weaning and short spacing between babies. In the Ministry of Social Welfare, we are deeply concerned with nutrition and child development, and it gives me pleasure to be at this workshop on weaning foods. Weaning can be defined as systematic introduction of food other than milk to provide significant nutrients to the infant.

One major issue is the age at which supplementary or complementary food should be introduced. Available literature indicates that this should be done not earlier than four months and not later than six months but there is no unanimity of opinion. This involves consideration of several factors; risk of infection and adverse effect on lactation in cases of too early introduction of complementary foods; and insufficiency of breast milk for the infant's growth and development in cases of too late introduction. A balance of these two factors is important.

Another issue in weaning relates to the nature and quantity of supplementation. Here, many relevant factors have to be considered: nutrient value, easy availability, suitable consistency, cultural acceptability, culinary feasibility, hygienic preparation, physiological acceptability or digestibility, frequency, quantity and volume.

It is important that the staple of the community should be the base and the place of preparation should be the home. The role of some traditional practices like multimixing, roasting and puffing, germination and fermentation needs to be amplified.

Expert opinion is virtually settled in favour of continuance of lactation during weaning as against abrupt total weaning. The importance of the role of husbands and communities in proper weaning must not be ignored. We must remember that the child's needs are not merely biological but also social and psychological. All this highlights the importance of education. Available data on weaning practices is rather scant, and whatever is available has not been fully analyzed for its policy and programming implications. Scientific studies for collection of data on weaning practices are costly and time consuming. We must consider the feasibility of collecting such data as part of the ongoing nutrition programmes to facilitate proper educational programme development.

Government supported supplementary nutrition programmes for the most needy children will continue to be needed for many years to come. The relevance of cheap processed foods should, therefore, not be totally ignored. I believe this workshop will be considering

these and many other issues relating to weaning and weaning foods. We have recently initiated steps for utilizing the talents of food and nutrition scientists in home science colleges for strengthening and monitoring the health and nutrition education activities in ICDS projects. The results of this workshop will be helpful in the furtherance of this collaboration between home science colleges and ICDS. In the Ministry of Social Welfare, we shall look forward to your recommendations with great interest and eagerness.

Thank you.

M. S. Dayal
Joint Secretary
Ministry of Social Welfare

I N T R O D U C T I O N

Infant feeding practices are strongly associated with the culture of a society. Rapid cultural changes due to industrialization and urbanization have largely modified such practices. Breast-feeding has been replaced to a great extent with bottle feeding. Apparent advantages and convenience of bottle feeding made urban women to overlook that the breast milk is the natural security provided for the survival of their offspring. To avoid further spread of bottle feeding and promote breast-feeding, concentrated efforts are being made by various international organizations, especially UN bodies like WHO, UNICEF, UNESCO, etc. to co-operate with country governments and other national bodies in programmes for the improvement of infant feeding practices.

While the advantages of breast-feeding are not disputed, the question is how long the infant can be supported by breast-feeding alone? The answer to this is somewhat uncertain. It is repeatedly re-emphasized by several groups, including the Administrative Committee of Co-ordination and Sub-Committee on Nutrition, that satisfactory growth and development of the infant and young child depend on (a) good maternal nutrition, (b) adequate breast-feeding, (c) timely complementary feeding and (d) appropriate weaning.

One major parameter used for measuring adequacy of breast milk is the growth of the infant. The occurrence of growth faltering is taken as an indication for the need of complementary foods. Studies conducted on the growth of breast-fed children[1] are somewhat contradictory

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1 UNESCO Nutrition Education Series No.3, Maternal & Young Child Nutrition (1983)

as some suggest the need of complementary foods only from the sixth month, whereas some others suggest their introduction as early as from the third month. It is, however, generally understood that the quantity of mother's milk is highly influenced by socio-physiological factors like the frequency and vigour of suckling by the infant.

A factor that hampers the early introduction of complementary food is the onset of diarrhoea and other diseases carried through food and water used for the preparation of complementary foods. If the growth faltering of a child who is only breast-fed is of a small dimension, the introduction of complementary foods before six months under unhygienic conditions may offset the advantages and even create a negative impact.

Introduction of complementary foods may be desirable from as early as the fourth month but it must be kept in mind that it is strictly related to the maternal nutrition on the one hand and to the social, cultural and economic conditions of the family on the other. It may, therefore, be necessary to develop different infant and young child feeding practices to suit different countries.

Since the average Indian mother is hard pressed both for money and time, prolonged breast-feeding is the most desirable practice. The data of the WHO study[2] conducted in seven countries indicate such trend in India. However, very late introduction of complementary foods is highly undesirable and damaging to the child.

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2 World Health Organization: Contemporary Patterns of Breast-feeding. Report on the WHO Collaboration Study on Breast-feeding. Geneva WHO (1981)

While early introduction of complementary foods may have a negative influence on a number of breast-fed children and may increase the risk of infections, timely introduction is necessary to avoid growth faltering and permit mental development. In a country like India with wide variations in socio-cultural and economic patterns among regions and individuals, generalized recommendations for maternal child nutrition will be of no significance. In order to strengthen the National Child Nutrition policies, specific area based recommendations for promoting appropriate infant and child practices will be necessary.

The term "weaning" is used to denote the process in which an infant changes from breast milk to a mixed diet, starting with small quantities of complementary foods given regularly in increasing amounts until replacement of milk is virtually complete. In a broader sense, this is a period in which the infant is generally introduced to new interactive experiences within his environment.

In terms of nutritional supplementation, the first insufficiency that emerges as a result of the difference between the requirement of the infant and the nutrients supplied by breast milk is in relation to energy requirements. While theoretically it is often suggested that this energy gap can be bridged by giving to the infant a small amount of the staple from the adult diet, in practice this is not simple. As a child grows, vitamins and minerals are also required in adequate quantities and need to be incorporated in the weaning food.

The most crucial factors to be considered for appropriate infant and young child feeding practices are: (a) at what age to introduce complementary foods; (b) what type of food; (c)how much; (d) frequency of feeding; (e) the production of complementary foods at home, village, community or industrial level; (f) what should the nutrient composition be and (g) how to educate mothers.

Recognizing the need to develop specific and appropriate guidelines for child feeding in India, UNICEF suggested to assemble a group of experts in the field of paediatrics, dietetics, nutrition, food technology and organize a two days' workshop to be held at the Home Science College of the Andhra Pradesh Agricultural University. The main objectives of the workshop were to review the existing infant and young child feeding practices with particular reference to the weaning period and drawing from the Indian experience to suggest more appropriate practices.

The seminar also assessed the advantages of large and small scale production of weaning foods and analyzed the possibility of modifying the home diet suitably for the infant and young child. Even after the complementary foods are made available, their use depends upon the knowledge, awareness and attitudes of the mother and her supporters. For this reason, a special session was dedicated to nutrition education.

The Workshop focussed its attention on the children below 24 months and on the problems related to the feeding of the infants with supplementary foods. Throughout the Workshop, it was made very clear that the supplementary foods introduced to the infants should not become a substitute to breast milk but they should be complementary to it.

INFANT WEANING - AT WHAT AGE SHOULD IT BE STARTED?

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Surveys that are large enough to reflect the community feeding practices of infants and young children in different parts of the country are very few. In the recent past, the National Institute of Nutrition, Hyderabad, under the aegis of the Indian Council of Medical Research (ICMR), and the World Health Organization (WHO), conducted studies that relate to feeding habits of infants and pre-school children (1-4). The ICMR studies were multicentric and covered about 36,000 children, while the WHO sponsored study, undertaken as part of an international study, was based on about 4,000 mothers from both rural and urban areas of Andhra Pradesh. These studies indicate that in rural India, breast feeding, besides being universal, is quite prolonged: beyond one year in the majority of cases. The introduction of food supplements is usually delayed. The quantities of solid food offered are meagre and seem to be more for taste than nutrition. Complete weaning (in more than 90% of children) takes place only towards the end of the third year of a toddler's life. No special problems are encountered by mothers who breast feed. The weaning food is often home made and in the poorer segments of the population, it consists of modified adult food. In contrast, the urban based, educated and often gainfully employed women, tend to breast feed their infants for not more than 5 months (the mean duration being 4.1 months). As a rule, supplements are introduced quite early. By the age of 12 months, almost all (more than 90%) the infants were fully weaned. In about 60% of infants, commercial baby foods were used as supplements, though not without problems.

Notwithstanding these discernible differences in rural-urban patterns of infant feeding, the fact remains that breast-feeding in India forms a dominant part of infant feeding and child rearing practice, and mother's milk constitutes the main source of nourishment during infancy.

In order to indicate desirable weaning practices by age in infants, the question that needs to be considered first is whether the infants who subsist exclusively on breast milk maintain positive health. If this is true, how long can one rely on breast milk alone as a source of optimum nutrition for infants? To answer these questions, we need to examine the available information on the breast milk of Indian mothers, which constitutes the main stay of nutrients and data on growth of infants, which is considered by nutritionists as an index of positive health. More specifically, data on the following aspects are necessary :

1. Requirements as well as actual intake of nutrients by infants at different stages of growth.

2. Growth pattern of infants under optimal nutrient supply, normal growth and growth in the conditions of intake prevailing in the community.

3. Quality and quantity of breast milk produced by an average Indian nursing mother.

4. Cultural constraints if any, in infant weaning.

Nutrient Requirements and Actual Intake

Table I provides figures for protein and energy allowances recommended by the Expert Committee of the ICMR (1982) for infants. These values are essentially similar to those recommended by the FAO/WHO Expert Group.

TABLE - I

Nutrient Allowances for Infants

Nutrients	AGE IN MONTHS			
	0-3	3-6	6-9	9-12
Protein g/kg/day	1.3	1.8*	1.8**	1.5**
Energy kcal/kg/day	120	115	110	105

* in terms of milk protein.

** in terms of equal proportion of milk protein and vegetable supplement with relative NPU of 65.

Withough going into the details of the basis on which these recommendations are made, it is sufficient to mention that the expert group in arriving at the nutrient requirements in infancy, were guided by metabolic studies in which bottled breast milk was fed ad lib to a series of infants and their growth performance followed. The amounts of breast milk consumed by the infants in the study were 836, 915 and 994 ml. at ages of 1, 3 and 6 months respectively.

Using these figures from the study, the Indian workers computed the amounts of breast milk that would be needed to sustain the level of growth observed in infants of well-to-do Indian communities. These optimal amounts are set out in Table II and compared with the amounts of actual intake of breast milk by India's infants as estimated in a cross sectional study.

TABLE - II

Requirements of breast milk to sustain optimal level of growth in infants compared to actual intakes

	AGE IN MONTHS		
	1	3	6
Optimal intake	851	881	964
Actual intake	530	640	730

Breast Milk

Well documented studies on lactation carried out in different parts of the world, including India suggest that the quality and composition of breast milk produced by poor undernourished mothers compares favourably with than of well nourished women. Although variations in certain vitamins and mineral content of milk were observed (they were low in the milk of undernourished mothers) no significant differences in proximate nutrients viz. protein and calorie, were seen (100 ml. providing 1.00 g protein and 65 Kcal). The daily milk output figures which ranged from 400 to 750 ml. in different studies were marginally lower as compared to yields of 850 ml. seen in well nourished mothers. This suggests that the infants born to women of a poor socio-economic level do not receive adequate nutrients, and that their growth performance cannot be considered as optimal even during early infancy.

Growth Pattern

Going by the rate of growth of infants, judged by the distance curves of body weight, it has been stated that the growth of Indian infants even those of lower socio-economic group, is satisfactory during the first few months of life. But a look at the actual body weights at different stages suggests that they are low when compared with not only the body weights of western infants, but also with Indian babies belonging to high income groups receiving either artificial or mixed feeds. Whether the lower body weight is due to relative insufficiency of breast milk and whether the body weight in early infancy can be improved by further supplementation of nutrients are questions answered experimentally by providing supplements to breast fed infants living in a village.

In this study, one group of infants was allowed to be fed exclusively on breast milk, according to the custom in the region, while the other group received, in addition to breast milk, a proprietary milk formula as a daily supplement till the age of 13 weeks, and thereafter, a semi solid cereal supplement in addition to the milk supplement till the age of 26 weeks. The supplements were started at the age of four weeks and continued in increasing quantities till the age of 6 months. The breast milk and the supplement provided nearly 2 to 2.5g protein/kg. of expected body weight and all other nutrients in adequate quantities. This did not result in a greater gain in body weights. The authors tried to attribute the failure to maternal malnutrition during the pregnancy on the analogy of animal experimental findings.

They have also considered the possibility of reduced intake of breast milk by the infants provided with supplements, as a factor contributing to the failure of growth observed in the experiment. However, two other facts that emerged from the study are noteworthy. One is that the values of weight observed at the end of the 6th month were significantly higher than the control, and secondly, the weight curve in the supplemented group was parallel to that of American infants upto 6 months, unlike the control group where the curve was a parallel only upto 3 months. In another study, longitudinally collected growth data on infants born to mothers in rural areas were analyzed to assess the mean age at which growth rates start declining. About one hundred infants were contacted at ages 1, 2, 3, 6, 9 and 12 months, their heights and weights recorded and their feeding checked at all points of time. The growth status of solely breastfed infants, in terms of percentage increments in height and weight, compared favourably with those observed in the above controlled experiment as well as with Harvard infants upto the age of about 5-6 months, but was impaired thereafter. On the basis of this, the workers at the National Institute of Nutrition observed that since growth status begins to decline around the age of 5 months, (with 95% confidence limits of 4.0 - 5.75 months), it is desirable to provide supplements to breastfed infants between 4-5 months. Although this suggestion has a statistical as well as a nutritional basis, it needs to be examined in the context of prevalent practices and other cultural considerations.

Infant Feeding Practices

Table III provides the distribution of 538 rural children according to supplementary feeding and body weight status, studied cross-sectionally in different parts of the country. It is evident that except a small percentage of infants, none received supplements before the age of 3 months, and by the age of 1½ years, the majority (86%) received supplements. About a fifth (22.1%) of infants received supplements between 3 and 6 months and another 25% during the subsequent months (6-9 months) of life. More than half (56.4%) of the children studied had supplements by the time they were a year old.

Comparison of body weights of children exclusively on breast milk plus 'habitual' supplements suggests that the beneficial effect of the supplements on body weights are seen only in children of the 9-12 months age group. The inference that could be drawn from these cross-sectional data is that the improved weight status of infants seen at 9+ months of age, should be the result of supplementary food that these children received during the preceeding three months i.e. 6 - 9 months. The lack of differences in the body weights of infants who received only breast milk and those on breast milk plus supplementation in the age groups prior to six months is in line with the observations made by Venkatachalam et al in their controlled study cited above. In other words, the age period of 6 to 9 months appears to be the period when supplementation produces demonstrable beneficial effect. It should be remembered that these children received supplements that were provided by mothers habitually and which reflected community practices.

The results indicate that the provision of supplements after six months will have a beneficial effect on the growth of infants of poor undernourished mothers. In other words, supplementation before six months does not seem to have any benefit on growth.

Cultural Constraints

It has been said that food constitutes a meeting point of nature and culture. At no other phase of man's life does culture seem to dominate the choice and acceptance of food available in nature as in infancy and childhood. In cultures where prolonged lactation is usual and delayed supplementation common, the advocacy of supplementation at a very early age is likely to be met with resistance. Also preparations for very young infants have necessarily to be either liquid or semi solid. The preparation of liquid/semi solid formulae under the existing conditions of our rural environment cannot be expected to be without the risk of over-dilution and contamination. Further, it entails extra time and money which rural mothers cannot afford. On the other hand, to allow these mothers to follow the dictates of tradition and culture is to permit preventable infant malnutrition to flourish. In short, this is to deny them the benefits of the science of nutrition.

Conclusions

In cultures where infant feeding practice is dominated by breast-feeding, delayed supplementation is the rule and infant malnutrition is rampant.

From the evidence cited so far, a case can be made for the initiation of supplementary feeding for breast fed infants belonging to poorer socio-economic groups around the age of six months. However, the introduction of supplementation earlier than the age of 6 months may be advisable only in societies where mothers are educated and have the means to provide supplements in adequate quantities under hygienic conditions.

TABLE - III

Mean Weight of Infants According to Feeding Habits

Age Group (Months)	N	Breast fed (BF)			BF + Supplements		
		%	Mean (Kg)	SE	%	Mean (Kg)	SE
0 - 3	71	94.4	4.0	0.11	5.6	4.3	0.25
0 - 6	86	77.9	5.2	0.13	22.1	5.7	0.24
6 - 9	64	75.0	6.5	0.18	25.0	6.1	0.29
9 - 12	62	43.6	6.5	0.20	56.4	7.1*	0.16
12 - 18	121	14.1	6.8	0.27	85.9	7.4*	0.12

Source: NNMB Rural Data unpublished.

* Significant at 5 per cent level (P $\leq$ 0.05)

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COMPLEMENTARY AND SUPPLEMENTARY FOODS FOR YOUNG CHILD FEEDING AT HOUSEHOLD, COMMUNITY, PROGRAMME AND INDUSTRIAL LEVELS

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I Complementary Foods at the Household Level

Household diets

From the point of view of custom, practice, feasibility and cost, it is obvious that it would be most convenient for the mother to feed the infant older than 6 months or the young toddler (1-3 years) on an easily modified family diet (Cowan et al, 1983). Examples of easy adaptations of an Indian meal would be: soft cooked cereal; pulse khichrees with generous additions of cooking oil (Gujarat); chapati soaked and pulped in hot unspiced dal, tea, milk, lassi or water (North and Central India); soft cooked rice combined with finely chopped and minced vegetables or "mother masticated" pieces of meat (North Eastern States); steamed tapioca or rice combined with flaked fish (Kerala); or ragi balls pulped in unspiced sambhar (Karnataka).

Generally speaking, underprivileged Indian families eat only twice a day. A soft and modified adult diet, therefore, becomes a problem since most foods are subject to very rapid spoilage (Barrell and Rowland, 1979). The pre-schooler faces another limitation in cereal diets of bulk constraint (Nicol, 1967). Jelliffe (1970) estimated the stomach capacity of the human weanling to be 150 to 200 gms. per sitting. The starch in a typical cereal feed would gelatinize

on cooking, trap water and would result in a concentration of low nutritional value per unit volume of cooked food. Ghosh (1977) emphasizes the need of educating mothers not only on frequency of feeding but also on the quantities of local diet to be fed to the child per feed. In support of Ghosh's advice, Schuetze (1982), observed that even middle income Gujarati mothers were totally unaware of the quantity of food to be fed to a toddler or pre-schooler.

There was overdependence on milk feeds because of the belief that this was ideal even for the "above threes". The majority of children were found to be underweight and afflicted with nutritional anaemia.

While Pasricha (1973) has reported that a young Indian toddler could satisfy his energy needs if fed with a normal Indian cereal-pulse bulky diet often enough, in practical terms this is not feasible with most low income group mothers who need to work for a living. There is, therefore, an urgent need to devise ways of making infant/toddler home diets as rich in nutrients as possible within the time, cost, fuel and utensil constraints that operate in a poor home. A multi-centric study of the ICMR (1977) has listed 44 recipes that can easily be prepared by mothers to provide 300-400 Kcal and 10-20 g. protein per feed to the child.

Simple Ready-to-Eat (RTE) or Ready-to-Mix (RTM) blended powders or mixes

In the light of observations made earlier, an under-privileged Indian mother may have to use a combination

of a modified home diet (two feeds) to ensure that her child obtains his RDA of energy and protein. Several investigators have formulated calorie and protein rich RTEs for young child feeding (see Table I). Almost all recipes used simple roasting as the method for processing raw food ingredients. The multi-centric ICMR study (1977), has listed 19 home-made instant mixes. The promising RTEs expressed, on the basis of 100 g. weight of total raw ingredients, anywhere from 300-400 Kcal and 12-15 g. protein. The incorporation of groundnut or sesame cake flour, or cheap pulses such as horse gram, helped in lowering costs.

The moot point, however, is - how successful have we been in the transfer of this RTE technology from lab to household? A sub-study of Project Poshak (1975), attempted to determine whether poor tribal and rural families could be taught to prepare simple cereal, pulse, oilseed RTEs at the home level. The results of this exercise were not very encouraging.

The factor that inhibited the regular acceptance of everyday simple infant and toddler foods in this class was the fact that a vast majority of tribal/rural mothers were below the poverty line. They worked all year in the fields and found the preparation of even the simplest cereal-pulse RTEs for their young child (6 months - 3 years) quite beyond their capacity. The poor purchase their food needs on a day-to-day basis which precludes any planned dietary expenditure for the family or the child.

Potential for promoting simple one-dish meals for young child feeding

Jelliffe (1967, 1971) was one of the first to popularize the concept of "multimixes", namely, double (cereal + pulse), triple (cereal + legume + dark leafy vegetables) and quadruple (adding animal protein to the triple mix). Our universally acceptable "khichree" is an excellent example of a one-dish-mix concept. Khichree can be fed twice a day to older infants and toddlers. Interesting and simple variations can be devised by the addition of seasonable vegetables, milk, lassi or an egg. Gopaldas et al (1983) noted that tribals had more sensible young child feeding practices than the non-tribals, one of the commendable practices being the feeding of a one-dish khichree made of maize, bengalgram, seasonal greens, and generous amounts of yellow pumpkin to the entire family. Chaughari (1964) demonstrated that a cooked triplemix of chickpea flour: local greens: jaggery (2:1:1) was well tolerated by children suffering from severe PEM. The Tamil Nadu Mid Day Meal Programme makes use of the dual concepts of the 'one-dish-meal' and heat energy conservation through the use of a hay-box to keep the cooked dish hot, and smokeless chulahs to obtain a more efficient heating system (Devadas, 1983).

Summary

(1) Complementary feeding of the young child from softened and unspiced home diet is the most practical feasible and cost-effective approach to adopt for two major

feeds per day.

(2) These foods should be supported by at least two more feeds of simple RTEs or RTMs to supplement the home diet.

(3) Low income group women find it difficult to prepare even the most simple RTEs/RTMs in their homes due to time, cost, fuel, and utensil constraints.

(4) Efforts should be made to develop simple and nutritious one-dish meals for young child feeding in different regions of our country.

II Complementary Foods at the Community Level

The Poshak experience of indigenous food development

A sub-study of Project Poshak (Gopaldas et al, 1974, 1975) was designed to systematically develop low cost weaning multimixes for children aged 6 to 36 months, from locally available foods, utilizing village level technology, in order to replace the imported food commodity Instant Corn Soya Milk, which was programmed in the project. The results of the study revealed that it was operationally feasible to attach a small food production unit to the rural health centres. Every attempt was made to employ village artisans despite the level of efficiency and performance being far from optimum when unsupervised. The village miller, and the traditional "roaster" of grains and "pounder" of spices were employed to conduct the processing under the supervision of the project field staff. Every large village in India has a

milling unit where atta (wheat flour) and besan (bengalgram flour) are milled. These three artisans formed the nucleus of the processing unit. The raw ingredients were dry roasted, milled and mixed together. Roasting is a simple popular practice to which almost all cereals, pulses and oilseeds can be subjected. The jaggery and groundnut were hand pounded and then admixed with the ground staple and pulse flours. The whole batch was sieved several times to ensure thorough mixing.

This study also demonstrated that familiar indigenous RTEs are more readily accepted by the suspicious rural dweller. Families living below the poverty line cannot be expected to bear the expense of the supplementary multimixes. Free distribution or heavily subsidized retailing needs to be considered. In economic terms, the production of these RTEs by village panchayats, Mahila Mandals or even the village miller would extend the reach and availability of these complementary foods to the communities that they serve.

Malted foods - a promising village level technology

The pioneering efforts of Desikachar and co-workers in the area of malted foods (Desikachar, 1980; Brandtzach et al, 1981; Malleshi and Desikachar, 1979) enthused us to take up a series of studies on simple malted RTEs for the Gujarat region. In the first study (Inamdar, 1981; Gopaldas et al, 1982), Malted (M) and Roasted (R) powdered multi-mixes of staple wheat:bengalgram:groundnut (WBG) were formulated (V/V) in ratios of 4:1:1, 8:1:1 and 8:1:0. The proportions of cereal, pulse and oilseeds were

deliberately kept simple, as the ultimate purpose was to transfer technology to the household and village level. Fortification of the multimixes with vitamin and/or mineral premixes was not considered for the same reason. The four main steps were (1) steeping, (2) germination, (3) roasting, and (4) milling. Each step was standardized on the basis of organoleptic acceptance. Our major findings were: the viscosity of M, WBG mixes in a 10 per cent hot slurry was significantly lower than R mixes; storage trials for M and R, WBG (4:1:1) which was the most acceptable mix, indicated a shelf life of 7 and 28 days, respectively, based on Indian standards for moisture, free sugar, alcoholic acidity, peroxide value and bacterial plate count for powder mixes. The study also established the significantly superior intake of M multimixes over their R counterparts by young children (2-5 years). Considering the fact that most supplementary feeding programmes are still "fed on site", the acceptability of a mix and the amount a young child can consume at a sitting are of paramount importance. In this respect, M multimixes appear to have a very definite edge over R counterpart mixes for young child feeding. Acceptability trials have to be conducted on young children through objective measures such as intake/plate waste in order to arrive at valid conclusions.

In our second study (Fotedar, 1981; Gujral and Fotedar, 1981) the superior growth promoting and protein quality of malted over roasted RTEs in the weanling rat was established.

Our third study (Master, 1981) which was an extended product test of malted vs roasted RTEs in lower middle income group Gujarati mothers of toddlers (1-3 years) contradicted the findings of study one somewhat in that mothers claimed that they and their young children preferred the roasted RTEs. Acceptability through intake in the 1-3 years age group was not conducted; hence, the claim of the mothers could neither be proved or disproved!

In our fourth study (Nyak, 1983) an attempt was made to see whether a combination of malted and roasted RTEs could be developed with an acceptable overall lowered viscosity. This study revealed that there was not much advantage in the malting of pulses. However, malting of cereals did result in a marked fall in their viscosity (about 50 per cent) as against their R counterparts. The proportion of 40% + 60% (R + M) cereal in RTE mixes was judged to be most suitable. In practical terms, this would mean that it would only be necessary to malt and mill the cereal grains and mix them in suitable proportions with roasted cereal and roasted pulse powders to obtain partially malted RTEs with acceptable viscosity in hot gruels or porridges. Acceptability trials in young children (2-5 years) indicated a significant increase in intake in the gruel and biscuit forms. In ongoing studies in our department, biscuits with malted cereals have better melting-on-tongue properties and have a better acceptability in our balwadi-age children.

Community level food processing units

Apart from the Poshak experience, other successful community-level food processing studies are those of the Indo-Dutch Project (1973), Kuntloor (Swaminathan, 1970), and the village malted food project of CFTRI (Brandtzaeg, 1979).

In the Indo-Dutch project, 70 gm. packets of RTEs containing wheat, bengalgram, groundnuts and sugar (modified Hyderabad mix), are produced daily by women of the local Mahila Mandals who earn a profit of 3-4 paise per packet. The major incentive in this community based operation is the important aspect of income-generation for needy women.

In the Kuntloor project, the community mothers contributed and made laddoos out of wheat, green gram, groundnut and jaggery. The venture was deemed successful, and it was in operation for 18 months.

Brandtzaeg (1979) at CFTRI developed a village based technology for malted RTEs with a batch process of 100-150 kg/batch. The project was deemed successful since it increased the interest, understanding and involvement of the villagers; the mothers understood the increased dietary needs of their young children better and there was a high acceptability of malted RTEs among the child subjects.

The setting up of community level (village or block) food processing units appears to be the best compromise between the household level at one end and the large or industrial scale at the other end.

Essentiality of providing simple equipment/machinery for community level RTE production

The vital importance of providing timely and adequate equipment, machinery and financial back-up cannot be sufficiently underscored (Brandtzaeg, 1979; Ropes, 1978). It is indeed a pity that even today research groups that strive to transfer a 'lab to land' technology and who have the temerity to make a demand for necessary items such as inexpensive prototype roasters, plate grinders, dispensing-packing-sealing machines, or even more mundane but necessary items such as plastic buckets, straw mats, tarpaulins, jute bags, large drums and karhais, sieves and drums, are summarily dismissed in their requests.

At the other end of the spectrum, is the Brady Crop cooker which cost about Rs.50,000 in 1975 in Sri Lanka (Ackels et al, 1976). This is an excellent intermediate technology type of machine for cooking fully cereal and legume grains by extrusion, but has met with little success in our country. Such a piece of equipment in the hands of a village co-operative or Mahila Mandal or even the CDPO of the ICDS, would go a long way in reducing the time, tediousness and fuel costs involved in traditional cooking/processing methods such as roasting, flaking, puffing, malting,etc.

The major constraint of purchasing power

About a decade ago, several workers were able to produce RTE mixes for 10-15 paise per 300 Kcal and 10-12 g. protein. This is a totally unrealistic price and in 1983 one cannot hope to produce even the simplest RTE (overheads included) for less than 40-50 paise per 100 g. ration.

In this context, a fairly long duration product test of six weeks showed that families in the income bracket of Rs.500-700 per month were willing to pay as much as Rs.1.25 per packet of 100 g. malted RTE of wheat: bengalgram:groundnut:jaggery (Master, 1981).

The rural poor would not be willing to pay this much. In fact, a study on pricing of the food supplement in Project Poshak (Gopaldas et al, 1975), revealed that most of the rural poor in Madhya Pradesh in 1974 stated that they would pay no more than 50 paise per kg. of RTE, or half the price they would pay for a kg. of cheap staple!

In support of these findings, Damodaran (1980), observed that despite protestations to the contrary, mothers were not prepared or able to spend more than 5-10 paise per day on the purchase of a low-cost indigenous complementary food. Much earlier (Rao et al, 1969) had shown that parents were prepared to spend only the equivalent of what they normally spend on cheap snacks such as roasted groundnut or puffed rice on supplementary toddler foods.

Summary

(1) It is operationally feasible to attach a small food production unit to rural health centres. However, to ensure a high level of efficiency and performance, strict supervision is essential.

(2) Community-based enterprises to produce RTEs should include the element of income generation, especially

for the women of the community.

(3) Price is a very real constraint in the marketing and regular purchase of RTEs by the low income group. It is unlikely that the rural poor will spend more than 10-15 paise per day on weaning or pre-school complementary foods.

III Supplementary Nutrition at the Programme Level

ICDS evaluation by the Programme Evaluation Organization (1979)

The evaluation observed that the majority of rural/ tribal projects had multiple Kharif crops of cereals, pulses, oilseeds and/or sugarcane (Table II). Low cost ready-to-eat local preparations of roasted and powdered cereal-pulse combinations, with or without oilseeds or sweetening agents, could be produced at the block or anganwadi level. The processed blended foods could be produced by the village miller under the supervision of the ICDS staff, or the community women could be organized to assist in this endeavour.

RTE and RTMs - deep fried items such as sev, murku, mathia and surti-type biscuits are recommended as they are high-calorie and high-fat density foods. Preparation such as laddoos, barfis, biscuits, buns and bread made of RTE blends and which have shelf life of approximately 10-15 days at a time, could be made in batches at the anganwadis. This would reduce substantially the time of preparation and of food distribution. Further, finger foods have a much better

chance of servicing as a supplement as the mother may be less likely to cut back on the main meal at home if she believes that the child only received a snack at the anganwadi. If these snacks are distributed at mid-break rather than just before the child departs for home, there are more chances of him being hungry and demanding his full meal at home.

There should be a clear recognition of the vulnerability of the different demographic groups - the pregnant woman and the older infant/toddler being the most vulnerable. There should be an equally clear recognition that the "below threes", especially the older infant and young toddler, require a different type of food preparation from the rest. Preparations such as thick gruels, boiled mashed tubers, mashed banana, thick dals with generous lashings of butter or any cooking oil, are suitable. The deep fried snack foods described above could also serve as 'take-home' food supplements for the 'below-threes'. The only two points to be stressed and restressed are the conversion of the snack food to a pulpy mass in boiling water, tea or milk and the frequency of feeding.

It is imperative to develop food delivery system which will effectively reach the inaccessible child and mother. Our attention to the 3 to 5+ years age group in the way of non-formal education, supplementary feeding, and so on, is diverting attention from the more important tasks of delivering nutrition and related health services to the most vulnerable. If one starts feeding the older children just because they are easily accessible, it will be difficult to accommodate those truly in need at a later stage.

Lastly, the planning, organization, implementation and monitoring of supplementary nutrition programmes is not only very time-consuming and expensive, but also calls for a good deal of classroom as well as on-the-job training in the various aspects of food management. The nutrition component being the single most expensive item in the ICDS package, much more attention needs to be paid to the husbanding of this precious and expensive resource for those in the greatest nutritional need.

Summary

(1) Most ICDS projects have at least one cereal and pulse crop once if not twice a year. This can form the base for a blended RTE cottage sector operation at the block headquarters.

(2) Fat rich fried and/or bakery products which could be produced at the anganwadi from the blended RTE flours on a batch basis would greatly minimize food preparation and distribution time.

(3) The pregnant woman, older infant, and young toddlers are the most vulnerable and require nutritional attention on a priority basis.

(4) Fingerfoods and snack foods can be reduced to pulp in hot liquids for infant/young toddler feeding.

(5) Effective food management is urgently required in the ICDS.

IV Supplementary Food Production at the Industrial or Mass Scale

Some examples of the Indian experience

Some examples of protein enriched foods produced for weaned infants and pre-school children are listed in Table III. Baalahar with an annual production of about 40,000 MT per annum heads the list of blended foods. It is a blended mix of raw flours and requires cooking. Extrusion appears to be the most promising process for both imported blends such as Corn-Soya Milk (CSM), Wheat-Soya-Bulger (WSB), Soya-Fortified-Bulger (SFB) etc.

Large plants have been set up in Anand and in Hyderabad. It is possible to produce extremely palatable products from converting donated or indigenous blended flours into various product types such as murmura, sev, murku and Shakarpara. Other types of processing used are partially malted ETEs such as CFTRI's balanced malt food or Nestle's Nestum, or Amul's Nutramul. Extrusion lends itself to fortifying products with vitamin/mineral premixes at a very low cost.

The advantage of a large scale, centrally located operation would include management efficiency, application of modern technological developments, fortification of the food supplement with minerals/vitamins, cost-effectiveness and the economics of large scale production, application of rigid quality control measures and the involvement of well established large food manufacturers. The major and overriding disadvantage would relate to transportation, administrative and distribution costs, followed by interruptions in the feeding programmes due to either shelf life problems and/or logistical problems.

Some sources of novel protein or food energy that are yet to be exploited

The National Dairy Development Board (NDDB) is experimenting with an idea of rendering molasses (currently used for cattle-feed) edible and combining it with peanuts from which the oil has been extracted. The peanuts would constitute a groundnut meal in a natural and appealing form. Since at the present time molasses is practically a waste product of the sugar industry, its salvage and use for human feeding has promise. In our department, Saxena (1983) has produced an edible syrup from Mahuda blossoms which has the potential of forming the basis of a cottage or even larger industry for the Mahuda tribal belts. Finally, the use of leaf protein concentrate for child feeding has been shown to be successful (Devadas, 1970).

Concept of social marketing

The NDDB has concretized this important concept of marketing pairs of products - one high priced and high profit oriented for the affluent, with another low priced and no-profit product for the masses. An example of this are Sugam Shrikand and Chaisati (tea whitener and the poor man's milk).

The food industry would do well to emulate NDDB which is pragmatic enough in its approach to realize that no food industry will stay in business unless its product mix is such that the loss of some of its 'social marketing products' can be offset by the gain of other high-profit items.

The Gandhigram Institute of Rural Health and Family Planning, Tamil Nadu, was the first in the field to produce low-cost protein rich foods made from groundnut cake, ragi and jaggery and marketed through local shops. Sales recorded a nearly ten-fold increase over a three-year period. Despite marketing problems, this socially oriented project could definitely be termed a success. Shopkeepers reported that sales of 350 g. packets at 50 paise each were higher than the sales of 50 g. packets for 7 paise each (ICMR Report, 1977).

Gopaldas et al (1975), attempted to evaluate the sale of 700 g. of Poshak marketed at 10 paise, 50 paise or Re.1 per packet through 'Fair Price Shops' located at great distances from each other in Ratlam district. The offtake was only 11 per cent when the food was priced at Re.1 per 700 g. packet. There was stiff consumer resistance to purchase, even though the price was equivalent to the price of the same amount of staple wheat. The food collection rates were not very different for food packets priced at 10 paise or 50 paise, thereby indicating that possibly a fifth of the rural poor might purchase a weaning RTE at 50 paise per kg.

Summary

(1) Simple blending of raw flours (Baalahar), extrusion (Amul) or partially malted and processed foods (CFTRI) are some of the types of processing used at the industrial scale.

(2) There are both advantages and disadvantages as with household or community level enterprises.

(3) Industrial production of cheap RTEs must necessarily be linked to the concept of social marketing.

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TABLE I

RTE/RTM infant foods that can be made at household level

S. No.	Name of recipe	Ingredients (g)	Nutritive value per 100 g.	
			Protein (g.)	Calorie
1	2	3	4	5
1.	Cholan-Bengalgram mix	Roasted cholum flour, roasted bengalgram dal, jaggery	13.6	389
2.	Cholam-greengram mix	Roasted cholum flour, roasted greengram dal, jaggery	14.1	384
3.	Ragi-bengalgram mix	Roasted ragi flour, roasted bengalgram dal, jaggery	12.3	380
4.	Ragi-greengram mix	Roasted ragi flour, roasted greengram dal, roasted groundnut, jaggery	12.8	351
5.	Maize-bengalgram mix	Maize, roasted bengal-gram dal, jaggery, roasted groundnut	13.8	386
6.	Maize-greengram mix	Maize, roasted green-gram dal, roasted groundnut, jaggery	14.3	381
7.	Groundnut cake porridge	Roasted groundnut, cake powder, roasted green-gram dal flour, Palon jaggery	26.6	369
8.	Groundnut cake powder/Jack fruit seed powder porridge	Roasted Jack fruit seed flour, roasted groundnut cake flour, palon jaggery	22.0	318
9.	Groundnut cake powder/dried green plantain powder porridge	Roasted groundnut cake flour, bengalgram, raw plantain flour, palm jaggery	14.4	303

Table I contd.

1	2	3	4	5
10.	Cholam porridge	Roasted cholum flour, greengram dal flour, groundnut cake flour, jaggery	14.3	406
11.	Cambu porridge	Roasted cambu flour, greengram dal flour, groundnut cake flour, jaggery	17.8	324
12.	Ragi porridge	Roasted ragi flour, roasted bengalgram flour, roasted groundnut cake powder	15.5	359
13.	Thenai porridge	Roasted Thenai flour, roasted mechai dal flour, roasted groundnut cake flour, jaggery	18.6	357
14.	Samai porridge	Roasted samai flour, roasted bengalgram dal flour, roasted sesame cake powder	16.8	398
15.	Tapioca porridge	Roasted blackgram dal flour, roasted groundnut cake, roasted tapioca vatual flour, drumstick pulp (raw without seeds), salt to taste	16.8	283
16.	Ragi malted porridge	Malted ragi flour, roasted groundnut cake flour, roasted horsegram flour, palm jaggery	16.4	394
17.	Sprouted foxgram porridge	Sprouted foxgram flour (raw), roasted ground-nut flour, plantain ripe	13.7	271
18.	Bajra infant food	Bajra, greengram dal, groundnut, til seeds, skim milk powder, sugar or salt to taste	18.6	389
19.	Ragi infant food	Ragi, greengram dal, groundnut, til seeds, skim milk powder, salt/ sugar to taste	16.0	369

Source: ICMR, 1977

TABLE II

Availability of major cereals, pulses, oil seeds and sugarcane crops as potential sources of locally available food supplements

Name of the State	Name of Project	Kharif	Rabi	Summer
1	2	3	4	5
	Rural			
Andhra Pradesh	Kambadur	Horsegram, jowar, bajra, groundnut, castor	Paddy, groundnut	-
Assam	Dhakukhana	Paddy	Paddy, pulses	Paddy, mustard
Bihar	Tarapur	Paddy, maize, pulses	Wheat, pulses, jowar	Maize
Haryana	Kathura	Bajra, paddy, sugarcane, jowar, giwara	Wheat, gram oilseeds	-
Karnataka	T. Narasipur	Paddy, jowar	-	Paddy, ragi, ground sugarcane, horse-gram
J & K	Kangan	Paddy, maize	Wheat, oilseeds	-
Kerala	Vengara	Paddy, tapioca, coconut, arecanut	Paddy	Paddy, ragi
Madhya Pradesh	Singroli	Paddy, millet, arhar, blackgram, til	Linseed, mustard potato	-
Manipur	Ukhrul	Paddy, maize	Oilseeds, pulses, vegetables	-
Punjab	Nurpur Bedi	Maize, groundnut,bajra	Wheat, gram	-

TABLE II Contd.

Name of the state	Name of project	Kharif	Rabi	Summer
Tamil Nadu	Nilakottai	Paddy, jowar, bajra, ragi, groundnut	Paddy, jowar, groundnut, sugarcane	-
Tamil Nadu	Thalli	Paddy, ragi, jowar, groundnut, sugarcane, castor, arhar, mustard	Paddy, mustard	Paddy, ragi, jowar groundnut, red-gram.
Tripura	Chawmanu	Paddy, pulses, sugar-cane	Wheat, pulses, potato, mustard	Paddy
Uttar Pradesh	Shankargarh	Paddy, jowar, bajra, arhar, til	Wheat, barley, gram, maize, linseed, mustard	Maize
Uttar Pradesh	Jawan	Maize, bajra, sugarcane,	Wheat, barley	-
West Bengal	Man Bazar	Paddy, maize	Wheat, oilseeds	-
	Tribal			
Andhra Pradesh	Utnoor	Jowar, blackgram, paddy, groundnut, redgram	Wheat, bengal-gram	-
Bihar	Barajamda	Paddy, maize, pulses	Wheat, pulses, oilseeds	Paddy
Gujarat	Chotaudepur	Paddy, jowar, maize, groundnut, pulses	Wheat, jowar	-
Himachal Pradesh	Pooh	Millets, pulses, potato	Barley, wheat	-

Table II (Contd.)

Name of the state	Name of project	Kharif	Rabi	Summer
Madhya Pradesh	Tokapal	Paddy, maize, til	Horsegram mustard, sugarcane	-
Orissa	Subdega	Paddy, pulses, sugar-cane	Pulses, wheat	-
Rajasthan	Garhi	Maize, paddy, black-gram, arhar, sugar-cane	Wheat, gram, mustard	-
	Urban			
Maharashtra	Bombay	Wheat, rice, sugar	As per ration card system	
Tamil Nadu	Madras	- do -	- do -	
West Bengal	Calcutta	- do -	- do -	
Delhi	Delhi	- do -	- do -	

Source: PEO (1979)

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TABLE III

Protein enriched RTEs for infants, toddlers and pre-school children at the community and industrial level

S. No.	Reference	Product	Ingredients
1	2	3	4
A.	Community level		
1.	Pasricha et al (1973)	Ready-to-mix powder	60 g. cereal (wheat, bajari or ragi) 15 g. pulse (roasted bengal-gram), an oilseed and 40 g. sugar/jaggery.
2.	Devadas et al (1974)	Weaning mix	Cereal (cholum, ragi or maize), pulse (roasted greengram or bengal-gram dal) oil seed (roasted groundnut) and jaggery.
3.	Gopaldas et al (1975)	Poshak (a)	Cereal (wheat, maize, rice or jowar), pulse (chana dal or mung dal),an oil-seed (groundnut) and jaggery in the propor-tion of 4:2:1:2.
		Poshak (b) least cost weaning mix	Same ingredients as Poshak (a) but in the proportion of 60:17:14:9.
4.	Rau et al (1975)	Extruded RTE	85 g. corn soya milk (CSM) and 15 g. salad oil.
5.	Chandrasekhara et al (1976)	Kerala indige-nous food (KIF)	Tapioca rava, soya fortified bulgar wheat (SFB) Rava and groundnut flour.
6.	ICMR (1977)	Ready-to-consume mixture	Roasted cereal (cholam), maize, ragi or bajra). Pulse (roasted or sprouted bengalgram, greengram or foxgram), oilseed (groundnut, groundnut/ sesame cake flour.

TABLE III (Contd.)

S. No.	Product	Place where produced/ manufacturer	Ingredients
B.	Industrial Level		
1.	Baalahar	Several plants in India	Cereal flour, groundnut flour, bengalgram flour or skim milk powder.
2.	Balanced malt food	Mysore	Cereal malt, pulses and skim milk powder, calcium carbonate and vitamins.
3.	Balamul and Balamul cereal with milk	Amul, Anand	Cereal flours, pulses, soya flour, skim milk powder.
4.	Enriched macroni		Wheat, cassava, peanut and chickpea flour, $CaCo_3$ & vitamins.
5.	Farex	Glaxo	Cereals, milk powder.
6.	Lactogen	Nestlé	Wheat flour, milk.

DESIRABLE WEANING PRACTICES BASED ON AGE

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Introduction

Most standard text books and publications on the care of the young child still state that semi solids should be introduced at the age of 6 months since most mothers can produce enough breast milk only for the first 4-6 months of an infant's life[1]. This is taught in medical and nursing colleges and enthusiastically communicated at health centres by personnel and often reinforced by colourful pictures of the "balanced diet" advocated at 4 months. The instructors are apparently quite unconcerned or not aware of the fact that the milk, fruit, fish, meat and eggs displayed on their posters are totally inaccessible to many of the mothers who attend these centres.

A note of caution was sounded by Ann and Maclean[2], who cited a group of enthusiastic breast feeders from an upper socio-economic group in New York. These mothers maintained adequate nutrition until the child was 9 months old, suggesting that especially in poor communities, the advantages of prolonging exclusive breast-feeding beyond the usually advised age of 4-6 months, might outweigh the disadvantages of the introduction of unhygienic supplements and consequential diarrhoeal diseases.

In 1981, C. Gopalan[3], also stated that in low income communities, with poor hygienic conditions and no access to safe water supply, the theoretical benefits of early supplementation, may be more than offset by the inevitable earlier onset of diarrhoea episodes, which are a major determinant of infant growth and nutrition in many developing countries.

It is quite possible that under such circumstances, the infants receiving early supplementation may arrive at their sixth month in a worse state of health and nutrition than the infants not receiving such early supplementation. The advantage in such circumstances may well lie in delaying the introduction of supplementary foods until the infant is 6 months old. Gopalan states, however, that supplementary foods cannot be delayed beyond 6 months, and most nutritionists would agree.

The Weaning Period

The Total Community Monitoring system of comprehensive health care delivery, practised in the Christian Medical College at Ludhiana since 1973, and in the Community Development Block attached to the College since 1980, has allowed for easy detection of the "at-risk" groups. High on the list are the infants and toddlers of poor communities.

Our experience convinced us some years ago of the harmful effects of "blanket" advice to begin supplementary weaning foods at 4-6 months irrespective of the ability of the beneficiaries to implement it. Few of the over-worked wives of landless labourers, most of whom are unable to comply with this advice, attend these clinics. Milk, except for tea, is an unobtainable luxury and they cannot afford dal (pulse) everyday. They feel that wheat chappatis, which supply the bulk of the family's calories, are unsuitable for a 4-6 month old infant, and as a result, they ignore the advice given at the clinic when they do attend. Many practise exclusive breast-feeding until 12 months.

This delay in adding solids, and its interaction with infection, is the main cause of morbidity and mortality, in the late first year and in the second year. It is, therefore, imperative that the infant receives adequate calories by the end of the 9th month. However, the crucial and so far unresolved question for poor communities is the month in which calories should be increased; whether it should be after 4-6 months as presently advocated, or at the time when the mothers think that their infants can cope with the bulky solids which they are able to provide. To date, the initiation of solids at 4-6 months has reached only the privileged who attend health centres. But home based contact with needy families, and nutrition health education "on the door-step", is all part of the strategy which hopefully will result in "health for all by 2000 A.D.".

It is possible that mothers impressed by the zeal of the worker who comes to the home, will be persuaded to act in the child's "best" interest and attempt to supplement breast milk early. This, in spite of the fact that they have no access to food which can be eaten by a 4-5 month old infant easily and in sufficient quantities to supply nutritional needs.

Breast-feeding and Growth

Is it not possible, when so much money and effort is being spent on implementing appropriate primary care, to teach workers to give advice based on needs and circumstances? Obviously, workers must be given broad guidelines.

If strengths already exist, surely it is wasteful as well as potentially harmful to start new practices which weaken the old ones. We have seen that in the villages of the Punjab, 84 per cent of 765 full term infants who were breast fed for at least 6 months, achieved satisfactory weight gains on exclusive breast-feeding. The poorly fed schedule caste mothers did better with their males than the rich did with their female children on breast feeding until the end of the 6th month.

It is true that 50 per cent had given some extra buffalo or cow's milk in addition to breast milk, but their achievements were marginally less satisfactory than in those exclusively breast fed. Supplements had been advised in the 5th month according to our approach at the time, but few had complied. Most mothers were giving modifications of food available in the home, only by the 7th month and this was done slowly and with difficulty. At 12 months however, 79 per cent of the children were receiving adequate calories. The results were as expected, a marked decrease in severe malnutrition and in late infant mortality. The growth curves show that the children did not lose out with the delay of supplements until the end of the 6th month. On the basis of this experience and concerned that mothers in poor communities might be influenced by home based advice which is not only unnecessary but also harmful, we have modified our strategy. We have found that the cheapest, easiest and best way to achieve good nutrition by 12 months is to "capitalize" on exclusive breast-feeding until 6 months.

Instead of being asked to "advise on breast-feeding", workers were given instructions on how to get the maximum supply of breast milk. We find that most multipurpose workers are inadequately informed about the importance of breast-feeding soon after birth, the usefulness of colostrum, the frequency of feeding and the need to "prod" awake a baby who sleeps soon after starting, and to keep him sucking until the mother feels a sense of discomfort resulting from the sucking of an empty breast.

Few advise feeding from both breasts each time, or suggest to begin with alternate breasts. Doubling the birth weight at four months should be the minimum goal and this was attained by 90 per cent of our schedule caste males showing that mothers belonging to poor communities can do something which is natural and satisfying to them. An argument against the prolonging of exclusive breast-feeding is that the expenditure of breast milk will compromise the nutritional status of a woman who is already eating inadequately. Little can be done to provide her a "good diet", but she can be persuaded to eat more of what she has in the home. It is however, very important to delay a subsequent pregnancy by the use of an intra-uterine device which we call an excellent "para-nutrient" both for the mother and her child.

Although we found situations in which exclusive breast-feeding until six months was not possible, this occurred only in 4.8 per cent of 802 infants. For this reason, we believe that it is not correct to give "blanket" advice to begin supplementary feeding at 4-6 months for the sake of the 5 per cent who need earlier supplementation.

Infants who need earlier supplementation can easily be identified by the home based health worker and appropriate action can be subsequently advised.

The mothers of the poor community, who have, in Punjab at least, enough wheat chappatis, some vegetable and occasional dal for the whole family in addition to tea twice a day, may be able to comply with the advice to add supplements at 5-6 months old by giving them tea and dal. The struggle to make a 5-6 months old infant eat chappatis, even if these are crumbled in tea, will be rightly regarded by the mother as an exercise of little use. Moreover, the time spent in the "struggle" will reduce the time available for breast-feeding, thus diminishing the milk supply before six months.

Moreover, the mother with the false confidence that her child is now receiving food, will ask the siblings to feed the infant while she goes off to work. As a result many of these children, especially females whose arrival is often a disappontment, are left at home to their disadvantage. It is not advisable for health workers to do anything which would cause this early separation that disrupts the bonding of mother and infant. In addition, early cessation of breast-feeding may deprive the mother of the contraceptive effect of lactation. The arrival of another child before the first is 15 months old is invariably a disaster for either elder or new arrival depending upon the sex. Moreover, it is a nutritional disaster for the mother who has not had the time to make good the demands of the earlier pregnancy and lactation.

It cannot be too strongly emphasized that the poor, even in Punjab, the richest state in India, do not have anything else on which their infants can attain at least 6 Kg. by 6 months except breast milk. They can, however, easily exceed this weight on exclusive breast-feeding.

There is no problem in persuading multipurpose workers to accept "exclusive breast-feeding" until the end of 6 months, since most of them are villagers and this advise is common sense to them. In this regard, it is much more difficult to persuade the higher cadres of the health care service.

A home recall was done to find out what was actually consumed for 2 days, by babies of two communities: one privileged, with milk available for all to drink, and the other poor with milk for tea only. All the children were 10-12 months and all were above 80 per cent of the 50th centile on the Modified Harvard Scale. The calories needs had been fully met where milk was plentiful, and C 1,000 were provided in the poor community but scrutiny of the items available showed a marked contrast in effort needed by the consumers.

Mothers of the rich can easily make their children eat the high density energy items available, in the 2nd half of the first year, when they have teeth and are beginning to take an interest in their surroundings. The poor mother, on the other hand, experiences great difficulty in persuading her infant to consume enough chappatis to provide 70 per cent of calories at 6 months. Consequently, few actually start before 8 months.

This perhaps is the optimal time for the poor, provided that vigorous nutrition education is given thereafter, so that the child at one year, while continuing breast-feeding, is no longer wholly dependent on breast-feeding and has his nutritional needs met fully by a share of the family food.

INTAKE OF UNDERPRIVILEGED
IN ADDITION TO BREAST MILK

(10 - 14 Months)

Milk	108 ml./day (in tea only)	- 14% cals.
Wheat	167 gm./day	- 64% cals.
Milk	585 ml./day	- 58% cals
Wheat	54 gm./day	- 16% cals

The Programming Approach

Programmes with "isolated" targets are bound to fail. Concentration by some on ante-natal care, others on family planning and others on feeding of under fives is not only bad organization, but does little for families. What is necessary is a "total" approach. Moreover, any strategy without an in-built evaluating system, may well be an expensive exercise in futility.

The National Programme of Primary Health Centre/ Subsidiary Health Centre with a doctor and multipurpose worker for 5 or 10 thousand, allows for a total community monitoring system, which in turn permits easy identification of these homes in which time must be spent.

Five or six minutes spent in each of the 30 homes visited daily irrespective of need, will achieve little. In 14 homes or so, there will be no "at-risk" person, no child below the age of five or no woman of child bearing age, so that only 2 minutes are needed to confirm that there is no illness. In another 6, there might be a target couple for Family Planning but no under 5 child; here 3 minutes may suffice, leaving two hours for the 10 homes where there are infants, under 5 children and/or pregnant women. Some of these will comply easily, leaving at least half an hour per home where advice has to be specific. Procedures must often be repeated and demonstrated. Similarly, pregnancy care, diet, delivery plans, exclusive breast-feeding immediately given after birth, the usefulness of colostrum, post delivery contraception, immunization, the care of sick babies, oral rehydration for diarrhoea and addition of supplements at an age where benefits outweigh the risks - all these must be communicated. Moreover, the effectiveness of this approach must open to easy evaluation.

So far, our approach has been regarded as "heretical" by most in spite of the benefits demonstrated. We believe that exclusive breast-feeding, taking every step to ensure maximum output, should be continued until the worker and the mother are convinced that the mothers can, and will feed the child with adequate quantities of modifications of the family diet, provided that nutrition and health education thereafter is vigorous, appropriate and constantly monitored. Present data leads us to believe that the optimal month may be the 9th, not the 7th month and certainly not the 5th. This will save time, money and the lives of children in poor communities.

The article of Jellife and Jellife (NFI Bulletin, April 1983) lends some support to our view, by their note of caution: "Introduce other foods only when benefits outweigh the risks". Have we the courage to delay the supplementing of breast milk until the end of the 8th month especially in poor communities? Can we ensure that the child receives adequate calories from a share of the family food thereafter? Concern for poor families who lose 1, 2 or even 3 children as a result of the interaction of malnutrition and diarrhoeal diseases should at least make us receptive to the examination of this alternative strategy.

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PRESENT WEANING PRACTICES, CONSTRAINTS FOR SUPPLEMENTATION, AND THE SCOPE OF MODIFYING ADULT DIET FOR INFANT FEEDING

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Introduction

Weaning is a process in which an infant is gradually introduced to a variety of liquid, semi-solid and solid foods to effect a smooth shift to the adult or family food pattern. Terms such as "supplementary foods" and "complementary foods" are used to denote the full spectrum of foods introduced into the dietary pattern.

The word "practice" is used to describe any procedure followed regularly. "Weaning practice" is also one such practice. It is not something new. Women in every household know that an infant has to be fed with additional foods as breast milk decreases. We are now concerned about the "weaning practices" followed in different sections of the population because weaning age corresponds to an age of nutritional stress. The questions before us are 1) What kind of weaning practices are followed in different groups? 2) What are the constraints for supplementation? and 3) How can we improve these practices?

The practices that are followed depend on the knowledge, beliefs and attitudes of the mother. These practices are passed on from one generation to the other as every young mother is supported by her mother or mother-in-law during the early period of motherhood. The type of feeding

practice that the mother employs depends upon the following variables:

(a) customs
(b) superstitions and beliefs
(c) religion
(d) cultural pattern
(e) place of residence
(f) socio-economic status of the family
(g) literacy status of the mother.

Any practice is likely to change with changes in attitude and knowledge, and weaning practice is no exception. Attitude and knowledge can be influenced strongly by socio-economic status and education. Thus we find in the same religious or cultural group, different weaning practices at different income and educational levels. Since weaning practice relates to the knowledge of the woman, it is her awareness that is most important. In a rural situation, the mother or mother-in-law has a strong influence on the practices related to infant feeding. In an urban set-up, employment makes women dependent on others, such as elderly relatives, servants or older siblings, for the feeding of their infants. No large scale data is available on how weaning practices have changed in the last two or three decades due to economic improvement and education of women. However, the differences observed in weaning practices have fitted largely in the following aspects:

(a) age at which weaning is started
(b) age at which semi-solids and solids are introduced
(c) type of weaning foods introduced at different stages
(d) frequency, regularity and quantity of the weaning foods introduced.

Age at which weaning is started

This is very difficult to assess, although it appears easy to record. The age at which weaning is begun, increases with decreasing income and vice versa. More than 50 per cent of infants are introduced to supplementary feeding by the age of 6 months (ICMR Tech. Rep. 1977).

One recent study (Thimayyamma et al, 1980) carried out in and around Hyderabad, has shown that women who had less than graduate education weaned by 4.6 months whereas women who had graduate education and above weaned by 3.9 months. A study conducted in Hyderabad city among working women showed that 62 per cent weaned their infants completely by 6 months. Working women in general were found to be anxious to wean as early as possible.

Age at which semi-solids and solids are introduced

The introduction of semi-solid foods such as gruel, mashed vegetables and greens, ripe bananas and biscuits soaked in milk has been reported as taking place between 6 to 9 months. The introduction of solids is reported as being between 9 to 12 months. Studies (Anjali Devi & Chittemma Rao in 1972, Vijayadurgamba and Geervani in 1974, Madhunath and Geervani in 1974, Jyothi and Geervani in 1980 and Poornima and Chittemma Rao in 1980) suggest a wide range of situations with regard to the weaning period as shown in the following tables.

TABLE I

Distribution of children by age of introduction of supplementary foods in low income population of Hyderabad

Age in Months	Bis-cuits	Choco-lates & toffees	Snacks	Roti	Rice	Vegeta-ble & greens	Fruits
6	19.6	1.2	10.0	2.8	-	-	-
6 - 10	44.0	28.8	81.4	40.5	13.7	17.6	13.5
10- 12	24.8	48.0	43.6	53.2	29.4	75.5	32.6
12- 18	2.8	22.0	3.3	2.8	7.2	31.4	30.6
18- 24	8.8	-	62.7	0.7	49.6	74.5	30.0

Vijayadurgamba & Geervani, 1974

TABLE II

Distribution of children by age of introduction of supplementary food in Hindu & Muslim communities living in urban slums of Hyderabad

Age in months	Hindu n = 129	Muslim n = 109
3 - 6	15.5	34.6
6 - 10	18.5	18.2
10 - 12	21.7	25.8
12 - 18	20.0	13.8
18 - 24	23.0	7.6
above 24	1.3	

Madhunath & Geervani, 1974

TABLE III

Distribution of children by age at which differnt supplementary foods are introduced by working women of Hyderabad

Percentage

Age in months	Farex	Fruit juices	Biscuits	Bananas	Rice & dal	Vegetable & greens
3 - 6	66	32	15	12	10	7
7 - 10	33	13	43	41	90	61
10 - 12	-	2	2	3	10	8

Geervani & Jyothi, 1980

TABLE IV

Distribution of children of working women by age at weaning

Age in months	Below graduation	Graduation & above
1 - 3	34.8	32.0
3 - 6	34.1	44.1
6 - 12	18.5	19.4
12 - 24	12.6	4.5

Thimmayamma et al, 1980

TABLE V

Age of introduction of weaning foods by selected groups of working and non-working women of Hyderabad

Foods	Percentage					
	0 - 6 months		6-12 months		12-24 months	
	Groups					
	Working	Non-working	Working	Non-working	Working	Non-working
Fruit juice	70	50	27	40	3	10
Milk	80	47	13	40	7	13
Soft-cooked foods like boiled egg & mashed vegetable	60	47	40	53	-	-
Rice & other adult foods	-	-	83	90	17	10

Poornima, B & Chittemma Rao, K. 1980

TABLE VI

Distribution of children in Davangiri by age at which semi-solids were introduced

Age in months	Percentage
3 - 6	26
7 - 9	24
10 - 12	32
13 - 18	17
19 - 24	1

Nirmala K. et al, 1981

Type of weaning foods introduced at different stages

The sequence of introduction indicates that milk is the first food introduced, followed by commercial foods (Farex), gruel, and bananas. Once the introduction of these foods has been successful, soft rice with supernatant dhal water, curds or supernatant of "Sambar"-like preparations and mashed greens are introduced to the child. Fruits other than bananas are introduced to infants only among high income groups. Biscuits are used more to satisfy the crying child, than as a regular food item.

At the first stage of weaning, milk with different dilutions is introduced, probably to compensate for the decrease in breast milk secretion. Data on milk based foods introduced by a low income group living in Hyderabad (Vijayadurgamba & Geervani, 1974), showed that 30 per cent of infants are given tea before the age of one, whereas buttermilk is given only after 18 months. Nearly 35 per cent of the population covered gave a 1:1 dilution of milk till the age of 12 months, and only 4 out of 250 infants covered in the study received undiluted milk after 6 months.

By the fifth and sixth months, infants in the urban slums of Hyderabad were fed with biscuits soaked in milk in the low income group, whereas in the middle and high income group, Farex and bananas were the predominant supplementary foods (Vijayadurgamba & Geervani, 1974, Anupa Bhatia and Pushpamma, Madhunath & Geervani, 1974, Anjali & Chittemmà Rao, 1972).

By the seventh and eighth months, the same foods introduced earlier, i.e., biscuits, bananas and Farex were continued,

but a larger percentage of mothers were found to give these foods at this stage. A small percentage (30-40) introduced rice and roti, and some snack-foods such as laddus, toffees and muruku.

It is only around the ninth and tenth months that nearly 90 per cent of infants were fed with rice and dal. A small number introduced vegetables, curds and greens. Greens were introduced occasionally, when prepared for the family.

Data on the types of foods introduced in South India are presented in the following tables.

TABLE VII

Common liquid/semi-solid supplements used in different places in South India

Coimbatore	Gandhigram	Hyderabad	Poona
Milk	Milk	Milk	Milk
Coffee	Coffee	Toddy	Tea
Rice gruel	Jowar porridge	Tea	Rice gruel
Ragi porridge			Jowar Porridge
Jowar porridge			
Tinned foods			
Fruit juice			

ICMR Tech. Rep. 27, 1974

TABLE VIII

Common solid preparations used in different places in South India

Coimbatore	Gandhigram	Hyderabad	Poona
Rice	Rice	Biscuits	Biscuits
Rice with ghee	Idli	Snacks	Jowar roti
Rice with milk	Dosai	Adult food	Wheat roti
Rice with rasam	Paniyaram	Rice	Rice
Biscuits	(Rice+black-gram)	Dhal	
Jowar "kali"	Jowar kali	vegetable	
	Ragi kali		

ICMR Tech. Rep. 17, 1974

TABLE IX

Per cent distribution of children by age at which solid supplements were introduced

Age in mths.	Coimbatore	Gandhigram	Hyderabad	Poona
0 - 6	30.4	1.3	-	-
6 - 12	36.0	86.7	5.0	2.0
12 - 18	32.1	-	24.1	20.7
18 - 24	5.5	-	19.9	24.7
24 - 30	-	-	26.2	31.3
30 above	-	-	24.8	21.3
n	470	257	141	150

ICMR Tech.Rep.27, 1974

Community
Kuppuswamy
Bangalore
Logic

In Tamil Nadu, porridge and kali, and sometimes roti, were also introduced after the ninth month.

The studies conducted in Hyderabad noted that flesh foods and eggs are introduced by less than 10 per cent of the sample covered (Vijayadurgamba and Geervani, 1974). Eggs were introduced between 10-12 months, but all other flesh foods are introduced after 12 months of age only.

Working women felt more comfortable with commercial foods, as they are dependent upon family elders or servants for the feeding of their infants. As a result, they find it convenient to give instructions when the infant is fed with commercial foods.

The type of weaning foods introduced was influenced by income level. With an increase in income level, education level also increases. The cumulative effect of income and education is reflected in the feeding pattern of middle and high income mothers.

The assessment of weaning practices in relation to income in an industrial workers' community revealed that high income groups introduce foods such as Farex and mashed vegetables in addition to rice and dal at an early age; unlike low income groups who introduce mainly rice and dal (Anjali Devi and Chittemma Rao, 1972).

TABLE X

Infant feeding practices in relation to income in an industrial workers community of Hyderabad

Weaning foods	Income groups (Rs.)		
	150-250	250-350	350-450
	n = 81	n = 107	n = 47
Fruit juice	33.7	55.8	45.0
Farex	10.1	13.5	74.0
Rice and dal	81.4	47.0	90.0
Mashed vegetable	18.0	13.5	29.7

Anjali Devi & Chittemma Rao, 1972

Another study conducted on the supplementary foods introduced between 6-11 months by Tamilians of different income levels, settled in Hyderabad, showed that milk, fruits and fruit juices, rice and dal, curds and commercial infant foods are the foods introduced. There was no significant difference in the selection of weaning food among different income groups. This was attributed to the education level of women. Hence education seems to play a greater role than income (Mythili, S.T. & Geervani, 1980).

Liquid and semi-solid supplements given in Coimbatore in different groups, indicated that between the age of 0-3 months, no supplement was given by the low income group; only 22 per cent of the middle income group and 86 per cent of the high income group introduced milk. Between the age of 3-6 months, milk is given by 100 per cent of high income groups and 40 per cent of low and middle income groups. In addition to milk, 33 per cent of the high income group introduce milk and Farex also.

TABLE XI

Supplementary foods introduced between 6 to 11 months of age by different income groups of Tamilians settled at Hyderabad

Foods introduced in order	Percentage of Households			
	Per capita income/months			
	Rs.125	Rs.235	Rs.370	Rs.740
	n = 21	n = 14	n = 17	n = 14
Milk	57	76	29	36
Commercial infant food	71	50	59	57
Fruit juice	24	14	12	7
Gruel	10	14	6	36
Banana	33	14	41	64
Greens	24	14	29	29
Rice & dal	57	43	65	64
Vegetables	33	36	59	57
Fruits	14	7	18	57
Curds	57	43	54	57
Biscuits	-	14	6	-

Geervani & Mythili, 1980

TABLE XII

Liquid and semi-solid supplements given as per age and income levels

Age in months	Supplement given	Monthly income in Rs. 60-200	200-600	600 & above
		Percentage of families		
0-3	Cow's milk	1	22	86
	Ragi porridge	1	2	-
	Farex	-	1	11
3 - 6	Ragi porridge	2	3	-
	Horlicks	-	1	-
	Fruit juices	-	11	37
	Cow's milk	41	40	100
	Farex	-	4	33
6 - 9	Ragi porridge	8	12	5
	Fruit juices	-	12	43
	Skim milk	1	-	-
9 - 12	Cow's milk	30	49	58
	Skim milk	10	41	-
	Farex	1	4	83
	Ragi porridge	11	4	-
	Rice porridge	-	2	-
	Fruit juices	-	4	93

Devadas et al, 1977

TABLE XIII

Solid supplements given as per age and income levels

Age in months	Supplements given	Monthly income in Rs.		
		60-200	200-600	600 & above
		Percentage of families		
0 - 3	Mashed banana	-	2	18
	Biscuits	1	5	16
	Idli	1	-	-
3 - 6	Plantain	1	1	11
	Biscuits	3	7	14
	Rice	10	7	-
6 - 9	Idli	2	2	5
	Dal	6	-	9
	Rusk	1	1	-
	Plantain	1	1	5
	Rice	15	15	50
	Biscuits	8	7	50
	Uppuma	1	-	-
	Idli	10	7	33
9 - 12	Banana, plantain	1	1	75
	Rusk	2	1	-
	Dal	-	2	-
	Dosai	2	3	25

Devadas et al, 1977

TABLE XIV

Infant feeding practices in relation to income in Bombay

(n = 900)

Age in months	Type of food	Percentage High income	Middle income	Low Income
0 - 3	Breast milk	63	68	83
	Fruit juice	15	0	0
	Cereal	2	0	0
4 - 6	Breast milk	50	60	78
	Fruit juice	33	20	0
	Cereal	11	0	0
7 - 12	Breast milk	33	65	71
	Fruit juice	55	33	20
	Cereal	50	22	45

ICMR Tech. Rep. 27, 1974

The above study conducted on 900 children in Bombay showed that weaning practices differed with income.

The type of weaning foods introduced in a tribal community is different from that in a non-tribal community. A study conducted in Maredumilli block of East Godavari district

TABLE XV

Infant feeding practices in relation to income in Bombay

(n = 900)

Age in months	Percentage		
	Per cent breast fed	Per cent introduced to Solids	adult food
0 - 11	20	23	7
12 - 23	20	42	31
24 - 35	28	25	42
36 & above	32	10	20

Pushpamma et al, 1982

revealed that breast-feeding was continued up to 2 years among 40 per cent of children without any supplementary feeding and in 25 per cent up to 3 years. As long as the child was breast-fed, hardly any supplementary food was introduced except for some fruit eaten by the children on their own.

Frequency, regularity and quantity of the weaning foods introduced

A mother might begin her infant on rice on a "good day" but may not feed him rice regularly. An infant may be given a little "payasam" (a sweet dish of milk and rice), but this may be limited to a special function or ceremony.

Much of the available information gives us an idea of the age of introduction and the type of foods introduced. In the low income group, only the staple foods are given

to the child on a regular basis. Rice and roti, which are prepared every day, were introduced regularly. Snacks are also not given regularly, as they have to be bought. Only in the case of working women, middle and high income groups, were the foods introduced being given regularly.

There is hardly any information available on the quantity of these supplementary foods given to infants. In many households the infants eat and share with other siblings or parents. Even the mothers would not know how much has been eaten and whether the infant has eaten adequately.

TABLE XVI

Food intake below 3 years of children fed with adult food

Food g.	1 - 2 years n = 48	2 - 3 years n = 64
Cereal	45.0	113.0
Pulses	2.0	13.0
Flesh foods	0.2	1.5
Milk	102.0	98.0
Sugar	0.5	2.0
Leafy vegetable	0.2	3.0
Non-leafy vegetable	-	7.0
Oils	0.2	4.0

Prahlad Rao, N. et al, 1969

The information on food intake also shows that the supplementary feeding adapted is inadequate in quantity and quality. More information is required on the quantity, regularity and frequency at which many supplements are introduced; this would help us to decide the adequacy of nutrients.

One of the recent studies on lactation performance (Geervani and Girija, 1982), illustrates that the average milk yield of a high income population, whose diet was more than adequate, was the same as that of a low income population. This is in spite of the fact that yield per feed was higher in the high income group. It has been observed that in the high income group, the anxiety to introduce supplementary foods by 3 months resulted in a reduction of the number of feeds. Supplementation that came too early, and the consequent reduction in the number of feeds led to the reduction in the secretion of breast milk.

Constraints for Supplementation

Several constraints are observed in various communities for proper supplementary feeding:

1. cost of supplementary feeding;
2. morbidity pattern of the infant;
3. poor appetite of the infant;
4. mother's attitude to child's health;
5. inability to judge the adequacy of breast milk;
6. lack of mother's support;
7. employment of women;
8. igonorance.

1. Cost of supplementary feeding

Expenditure on the child begins with the introduction of supplementary foods. If the child can be given a part of adult food, additional expense may be negligible. But supplementation usually begins with milk, biscuits, and snacks and all three need to be bought. These items cannot be kept as exclusive foods for the infant, as siblings in the family tend to share the food.

A pilot study conducted by the Department of Foods & Nutrition (College of Home Science), on the cost of infant feeding and care in low, middle and high income groups revealed that costs ranged between Rs.1.26 to Rs.4.91 per day.

Costs were assessed on the basis of the cost of artificial milk, milk bottles, nipples; the cost of additional foods consumed by the mother to promote breast-feeding; the cost of medicines, consultation, and transport; and the cost of time spent on feeding.

TABLE XVII

Influence of income on cost of infant feeding

Income/ Age in months	Food	Bottles, nipples, soap, fuel, etc.	Doctor, medicines, transport	Total cost per day Rs.
Low Rs.750				
3 - 6	1.24	0.26	0.35	1.81
6 - 9	0.85	0.23	0.18	1.26
9 - 12	1.0	0.27	0.39	1.66
Middle Rs.750-Rs.1500				
3 - 6	2.00	0.24	0.60	2.84
6 - 9	4.05	0.22	0.20	4.47
9 - 12	3.25	0.64	0.22	4.11
High Rs.1500 & above				
3 - 6	2.70	0.61	0.14	3.45
6 - 9	3.70	0.71	0.50	4.91
9 - 12	3.20	1.04	0.70	3.94

Geervani, 1980

The cost of feeding decreased at the first stage of weaning in low income groups, whereas in middle and high income groups it increased.

TABLE XVIII

Influence of type of feeding on the cost of feeding and expenses on doctor and medicines

Income	BF	AF	AF BF	AF NMS	BG NMS	BF+NMS+AF
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Low						
Food	0.28	2.06	2.11	2.04	1.29	1.62
Medical	0.15	0.85	0.57	1.51	0.26	0.24
Middle						
Food	1.16	-	1.65	5.24	2.98	4.32
Medical	0.05	-	0.48	0.55	0.04	0.33
High						
Food	1.02	2.88	1.18	5.64	-	4.89
Medical	0.10	1.25	0.55	0.79	-	0.11
Mean						
Food	0.82	1.65	1.65	4.31	1.42	3.61
Medical	0.10	0.70	0.53	0.95	0.10	0.23
T o t a l:	0.92	2.35	2.18	5.26	1.52	3.84

Geervani, 1980

BF : Breast-feeding
AF : Artificial feeding
NMS : Non-milk supplements

It is clearly seen that BF+NMS is the least expensive method of feeding; medical expenses were also the least in this case.

In the low income population, preparation of any food, especially for the child, adds to the family's expenditure. If low cost wholesome weaning food, specially suitable for infants 5-8 months old, is made available, the child can get adapted later to adult food.

2. Morbidity pattern of the infant

At the early stages of weaning, infants are exposed to infection through food or water. In addition to this, poor environmental sanitation leads to frequent diarrhoeas, infection of respiratory tract and fevers. Due to inadequate medical attention, the duration of illness increases and in turn the introduction of supplementary foods gets delayed. Although many supplementary foods can be given during illness as well, mothers tend to relate illness with supplementation. Morbidity tends to disrupt the weaning process and also delay weaning. Quick medical attention to relieve the infant of health problems seems to be the only remedy. Simultaneously, mothers must be made to understand what kind of supplementary foods can be continued in spite of illness.

3. Poor appetite of the infant

Poor appetite is a consequence of morbidity and of nutritional problems. An undernourished child has a poor appetite. The mother needs to exercise much more patience to feed an undernourished child. In families where infants are undernourished, mothers also tend to be undernourished; the result is a lack of motivation to feed their infants. Due to this lack of motivation, mothers do not take the trouble of feeding the infant, and the vicious circle

Inadequate supplementation	Under-nourished child Under-nourished mother	Poor appetite - lack motivation Impatient to feed	Inadequate intake	Severe mal-nutrition

4. Mother's attitude to child's health

The mother's attitude towards the child's health is crucial in the initiation of weaning the child gradually to adult food. In the middle and higher income groups, the attitude towards child health is far more conducive to weaning than among the low income bracket. In view of the small family norms adopted by middle and higher income groups, such groups tend to be more careful in feeding their infants.

Some middle income and lower middle income working women tend to spend on expensive foods such as Farex and Nutramul to feed their infants. But in the low income groups, the value attached to the child's health, particularly of the third, fourth and fifth child is so low that mothers are not able to pay enough attention to supplementary feeding. Although no data can be quoted in this regard, most nutritionists with field experience can recall mothers saying "God gave us the child and He will take care of the child". If the mother has any problem either nutritional or social, the infant bears the brunt of it.

5. Inability to judge the adequacy of breast milk

In most cases, women are under the impression that breast milk is adequate till the age of 6 months. This, however, is not true for all women. Although some can afford to feed, they initiate supplementary feeding as late as 8 months presuming that there is no need to do so

earlier. Checking their infants' weights and assessing the adequacy of breast milk, based on normal growth, enable mothers to begin supplementation. These requirements can be met by mothers if they have access to facilities for weighing children as well as nutrition education at health centres.

6. Lack of mother's support

If we recall the feeding practices in the past, say two decades back, every young mother was supported by her mother, mother-in-law or grandmother, who had plenty of time to supervise the feeding of the infant and to prepare special snacks, particularly at the time of weaning. The nursing mother would stay in her parents' home for almost eleven months, enabling her to devote all her time to the infant. Even the community would help by sending special food to the lactating mother.

Such a supportive social system has almost disappeared and it has been replaced by more and more nuclear families. The economic situation demands the migration of families. Women of low income, in both rural and urban areas begin working outside the home by the time the infant is 3 months of age, leaving the infant in the care of sibling.

This social change has disrupted some of the good practices that prevailed in the more traditional system. Creches are one way of replacing this lost alternative support. If an adequate number of creches are set up, and infant feeding is taken care of by institutions, the problem can be solved.

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7. The employment of women

Women's employment has solved the economic problems of the family to some extent, but has created some nutritional problems. Educated or uneducated working women are dependent on others for feeding their infants. They are prepared to buy weaning foods which can be prepared quickly. But not many weaning foods are available for such income groups. Those who are employed in the organized sector including factories, hospitals and offices, need an institutional arrangement to take care of supplementation. Farm labourers who belong more to the unorganized sector, have hardly any opportunity to carry out supplementary feeding because of their absence from the home. Several rural areas do not have enough creches; moreover, regular supplementary feeding is not possible for employed women unless feeding is organized for the community as a whole.

8. Ignorance

Though poverty is one of the reasons for not introducing suitable supplements to infants, even the high socio-economic strata is found to be lacking in proper supplementation of their children's diet. The main reason for this is the fear born out of ignorance. Various diet surveys carried out all over India have revealed that young children, both in rural and urban areas are not given green leafy vegetables, fruits such as papayas, mangoes, fleshy foods and legumes, though they are cooked for the family. The cause is the belief that these foods cannot be digested by the young child. Some foods such as citrus fruits, papayas, eggs and buttermilk are regarded as hot or cold foods and hence, they are avoided. In rural areas of Andhra Pradesh there is a belief that early supplementation of food leads to kwashiorkor.

9. Adaptation of adult diet to infant feeding

The adult diet in South India comprises mainly of a cereal and dal. Vegetables, curds or buttermilk are used mainly among middle and higher income groups. In some families, adults consume two main meals and in some, three main meals. In rural areas millet is used in place of rice; in others, rice is used for some of the meals, and wheat in the case of urban families. Essentially, the problem of modifying a cereal based adult diet is a question of bulk. Modification should not be elaborate and time consuming either.

Cereals and millets can be ground into fine flour, into granules such as suji and flakes. With millets, the problem is fibre, which reduces the digestibility. To some extent, fibre can be reduced by sieving the flour. Since it is recognized that an adult diet cannot be given to an infant without modification, the questions before us are as follows:

(i) What combinations of adult food can be suitably modified?

(ii) What should be substituted or added to the adult diet in order to make it suitable?

(iii) In what manner should the preparation of food be modified?

(iv) How frequently should the infant be fed?

Let's examine the options one by one.

(i) A cereal in combination with either dal or vegetable is suitable for the infant. Both combinations are good provided that an adequate amount of dal or vegetables is included in the diet.

Dal,but not dal water, vegetable but not vegetable extract, should be eaten along with rice or roti. The emphasis should be on the amount and type of vegetable to be added to cereal. As long as the proportion of cereal to dal is maintained at 5:1, the cereal or dal the family cooks can be given to the infant also. It is important that a child gets one serving of dal and one serving of vegetable along with his rice every day.

(ii) In order to enhance the nutritive value of the adult diet, and to make it suitable to the infant, certain substitutions and additions have to be made. The use of jaggery in place of sugar, green leafy vegetable in place of other vegetables, curds in place of butter milk, fermented cereal preparations in place of boiled preparations, and germinated gram instead of boiled grams are only examples of substitutions that can help to enhance the nutritive value of the diet. The addition of a teaspoon of fat or oil into the child's diet can help to increase the calorie content of the diet without increasing the bulk. The introduction of eggs, undiluted milk, seasonal fruits, snacks made out of low cost high calorie and protein foods are examples of small changes and additions to adapt the family meal pattern to the infant's diet.

(iii)This is an important aspect of infant feeding. In adapting an adult diet, the problem is for the main part, the bulk of the diet. No infant can eat quantity of an

adult diet to meet his requirements adequately, especially in the case of rice-based diets. For example, boiled rice increases in volume and feeding a child with large bulky food satisfies hunger and keeps the infant quiet. Unfortunately, foods that satisfy hunger do not necessarily satisfy growth requirements. Bulk is a problem in a rice eating population. At least some of the preparations chosen for infants should be small in bulk and rich in protein and calories. In a millet eating population, the preparation made for adults may have more husk. In adapting to the adult diet the child's diet, it may be necessary to use flour which has been sieved.

The introduction of a few fried and baked foods are advantageous because of the density of calories. Laddoos made of roasted flours and jaggery syrup is also a concentrated food. Cereals, oilseeds and legumes can be blended well, in good proportion, in such products. Such preparations can be eaten by adults as well.

(iv) An important feature to be taken into consideration is that in many homes, infants are fed when adults are fed, i.e., twice or thrice in a day. Infants cannot consume an adequate quantity in two or three meals as adults can. Four to five feeds are necessary. Snacks can be introduced in between the meals. It is the experience of all those who have had occasion to feed infants, that their appetites are not uniform and that they have their likes and dis-likes. Each mother needs to observe the quantity consumed by the infant at each meal, and compensate for any inadequate intake by choosing a concentrated food, or by feeding more often.

The success of infant feeding depends upon the mother's understanding of the infant's needs, and her ability to wean the child and adapt the infant to a suitably modified adult diet. How well the family has prepared the young mother and what opportunities she has had to learn to adapt, decides the future of the infant.

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PRODUCTION OF COMPLEMENTARY FOODS AT HOME AND AT THE COMMUNITY LEVEL

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Breast-feeding continues to be the mainstay in infant feeding in most parts of India. The duration of breast-feeding ranges from one to three years. Supplements are generally introduced in the second year. This delay is mainly due to the belief that other foods are not essential as long as the child receives breast milk. Studies on the growth of infants have shown that breast milk alone can sustain a suitable rate of growth till the age of 4-5 months. Beyond that age, growth slows down unless additional food is provided. The major consequences of giving inadequate or wrong kinds of food are: increased susceptibility to infections and frequency and severity of diseases, decreased physical performance and increased mortality.

In the absence of appropriate weaning foods, the frequency and severity of health problems rise sharply with earlier weaning. Furthermore, the younger the child, the greater the risk that the sequelae of the problems become irreversible. Under existing conditions, breast-feeding, or the lack of it, decides between life and death for the vast majority of infants.

The complementary approaches to this problem are to ensure that breast-feeding is continued at least throughout the first year of life, and to ensure that suitable weaning foods are available and used to complement breast milk as the child's nutritional requirements increase beyond the levels that can be met by breast milk alone.

The meeting of the consultative group on Maternal and Young Child Nutrition held in Geneva on 1-4 September 1980, defines the process of 'complementary feeding' as one which is not intended to replace, interrupt or interfere with the mother's breast-feeding capacity. In fact, the intention is to promote the breast-feeding of the infant for as long as possible and to recommend that complementary feeding be initiated only when the mother's milk production is inadequate to meet the energy and nutrient needs of the child for normal growth and development (Food and Nutrition Bulletin, 1981). Hence, the development and use of processed weaning foods -- intended to complement breast-feeding through the utilization of locally available and culturally acceptable foods -- assumes significance.

To be able to understand how dietary improvement can be achieved with complementary feeding and formulated foods, the following information is necessary:

1. The food habits of the local people/community.
2. The actual food intake of the family/community (quantity).
3. The kinds of foods eaten by the family/community and the foods given at weaning (quantity).
4. The cost of the food sources.
5. The amounts of foods given at weaning.
6. The patterns of food intake (number of meals, items on the menu, etc.).
7. The age of the child when a complementary food is introduced.
8 The frequency of intake.
9. Modes of preparation of the complementary foods.
10. Forms in which the complementary foods are consumed.
11. How the complementary foods are stored.

Development of complementary foods should be governed by the following principles:

High nutritional value and good supplementary value: Weaning/complementary food mixtures should have the highest possible energy value. The proportion of fibre and other relatively indigestible materials must be low. The total quantity consumed should be reasonably small in order to complement other foods.

The protein content should not be lower than 20 per cent and the quality of the protein should be good [Net Protein Utilization (NPU) alone 60 and 65 if possible]. If the quality of the protein is higher, the concentration can be reduced proportionately. The presence of fat improves the acceptability of the mixtures while helping to reduce bulk. The linoleic acid content should be at least one per cent and the fat content can appropriately supply up to 25-30 per cent of the energy value of the product. It is advantageous to incorporate as much fat as is technologically and palatably feasible into the mixtures, provided the preservative quality of the food is not adversely affected. The mixtures should be fortified with vitamins and minerals, where necessary. If green leafy vegetables are added daily, such fortification may not be necessary.

As far as legumes and oilseed protein concentrates are concerned, it should be remembered that some undesirable/ dangerous/toxic substances may be present. These must either be inactivated or removed before these protein foods are incorporated into the products. Among these undesirable substances are the trypsin inhibitors present in soyabeans and other pulses, the free gossypol in cotton

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seed, and the haemagglutinins in some legumes. Mycotoxins may also be present and aflatoxin, which is produced by aspergillus flavus, has been found in groundnut and cotton seed cakes.

Acceptability: The addition of sugar or small quantities of salt can improve the acceptability of the mixture. The acceptability of formulated foods can be enhanced wherever it is economica ly feasible, by modern manufacturing processes such as pre-cooking and roller drying, extrusion cooking and enzyme treatment.

However, for the present conditions in India, these may not be practical. Mild flavouring with lemon juice or other flavouring articles helps to increase acceptability.

Ease of preparation: Complementary foods should be prepared without much elaborate processing. Complementary foods should be developed in forms which make their preparation easy at the time of feeding by the addition of small quantities of safe water (boiling or boiled and cooled); or by adding water, followed by boiling for a short time, to make a porridge or gruel of the correct consistency. The ingredients added to the product should lend themselves for such preparation.

Low cost: The complementary foods for the young children in the low income strata of society must necessarily be low in cost.

Shelf life: The product should remain acceptable from the organoleptic and nutritional point of view, and free from any toxic or other changes for a period of at least 4-6 months in a tropical environment. An indication of the date of production or date of expiry is highly desirable.

Local availability: The ingredients of the complementary foods should be obtained from local areas, so that the food items will be familiar to the people. Only production at the local level will ensure that the complementary foods will be less expensive and culturally acceptable.

These general principles apply equally well for preparation at home level, community level and large scale level, if the food is to have practical use and wide acceptability. However, certain specific considerations have to be kept in mind for community and large scale productions. At the community level, the two main points to be considered are whether the complementary food is to be distributed before or after preparation, consumed on the spot or taken home and whether the preparation is carried out at a centrally located place such as a central kitchen. If the food is to be prepared in a central kitchen, the ease of preparation, distribution and all the associated points, such as keeping the food clean, hot and served under hygienic conditions, need consideration. As far as possible, such foods should be individually packed so that minimum handling is necessary. If given at a central level to the mothers themselves all the instructions for handling should be given. Packaging should also be considered for large scale preparation. The package should protect the product from insects, micro organisms, humidity and possible contaminations. Testing of the product to ensure safety for human use is another point to be considered. The pre-clinical testing includes toxicity tests on animals and micro-biological examinations of the product during all stages of manufacture up to the final packing for the consumer. Studies on the nutritional value should also be carried out. Proper labelling with dates of preparation and expiry and also proper instruction for preparation, should be a "must" in the interest of the consumers.

Complementary foods can be of two types: (a) dry, ready-to-eat mixtures, and (b) those which are prepared daily. A number of dry, ready-to-eat food mixtures have been developed by Sri Avinashilingam Home Science College. Among these, a set of six weaning mixtures developed under the name "Kuzhandai Amudhu" were found to be promising. The composition and cost of these recipes are presented in Table I.

TABLE I

Composition and Cost of Kuzhandai Amudhu

Ingredients	Amt. grams	Cost Rs.
Roasted maize flour	37.5	0.07
or		
(Roasted sorghum flour)	(37.5)	(0.06)
or		
(Roasted ragi flour)	(37.5)	(0.05)
Roasted Bengal gram flour	25.0	0.11
or		
(Roasted green gram flour)	(25.0)	(0.11)
Defatted groundnut cake	12.5	0.05
Jaggery	25.0	0.06
Total:	100.0	0.29

The infant food "Kuzhandai Amudhu" developed, tested and patented by Sri Avinashilingam Home Science College, Coimbatore, is a combination of a cereal, a pulse, roasted

groundnuts and jaggery in the ratio of 3:2:1:2, respectively. Human and animal feeding trials were conducted to establish the growth promoting value of these mixtures on par with skim milk powder. Reports on the development of such "ready-to-eat" complementary foods from various laboratories suitable to their respective regions are available from NIN, CFTRI, Gandhigram and others. What is lacking today is not the technical know how but zeal and enthusiasm on the part of scientists to sell this technical know how, establish market linkages and control the cost.

The other type of complementary foods consists of those which are prepared as part of the menu every day. Our experience with a long term feeding trial on pre-school children with a combination of locally available foods such as cereal/millet with pulses, green leaves, root vegetables and oils brought out impressive nutritional benefits. The composition of one of the formulated diets is given in Table II on the following page.

In Tamil Nadu, a novel venture of a nutritious meal programme which covers all children between 2-9 years below the poverty line was introduced by the Chief Minister and has had impressive results. Nearly 7 million poor children in the state are being fed all 365 days of the year, at an estimated cost of Rs.120 crores.

The meal for the pre-school children (2-5 years) consists of:

	Per day per child
Rice	80 g.
Legume or dal	10 g.
Oil	7 g.
Vegetables	50 g.
	(green leaves - 25 g.
	other vegetables- 25 g.

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TABLE II

Formulated composition of the rice and ragi based diets to meet two-thirds of the daily recommended allowances for pre-school children

Foods	Quantity in grams	
	Rice based diet	Ragi based diet
Rice parboiled and milled	170.80	185.14
Sweet potato	21.50	25.10
Horse gram	64.36	52.43
Sesame	25.10	25.10
Amaranthus	26.21	19.16
Groundnut	21.45	25.10
Other ingredients		
Red gram dal	35.55	35.55
Drumstick leaves	14.73	14.73
Potato	20.11	20.11
Bringal	23.20	23.20
Banana	7.24	7.24
Milk	37.55	37.55
Jaggery	6.15	6.15
Groundnut oil	3.95	3.95

In the case of children between 6-10 years, the nutritious meal constitutes 100 g. of rice, 15 g. of pulses, 7 g. of oil and 50 g. of vegetables, of which 25 g. are green leaves.

In the schools and balwadis, children are served the above foods in the form of mixed rice preparations. Systematic evaluation of this ongoing programme has indicated that children enjoy these meals in the anganwadis and schools and that their nutritional status has improved considerably.

In the interest of the well-being of millions and millions of nutritionally affected children from economically backward and culturally bound societies, it is the duty of nutritionists and homescientists to spread the message about such locally available complementary food. This must be communicated to the public in a language which they understand, and at the grassroots level, so that it is well within their economic capacity. There is also a need for collaboration by local industries to patent such foods and to bring them to local markets so that community/ large scale production of such complementary foods are tested and developed along nutritionally sound lines. It is imperative to identify the ways in which to encourage the local production of such complementary foods, and put them in the market while keeping the cost minimal. The policies of the state and Central governments should be geared towards this and grant whatever subsidies are necessary.

DISSEMINATION OF NUTRITION INFORMATION ON WEANING PRACTICES

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Introduction

Malnutrition is a multifaceted problem. The unfortunate state of nutrition in countries like India is attributed to several factors. Poverty and low purchasing power are no doubt major factors contributing to malnutrition. Lack of awareness regarding nutritional needs and paucity of information also aggravate the problem. The information gap is especially marked regarding what concerns the needs of the children.

According to a WHO study in 1981, only 12 per cent of poor rural Indian mothers give foods other than breast milk when the child is 6-7 months of age[1]. The quantity and nutritional quality of these supplementary foods have been found to be very unsatisfactory and such defective weaning has been held responsible for the poor growth of infants beyond the age of six months. Investigations conducted in various regions of the world have revealed that faulty weaning is not only responsible for Kwashiorkor and Marasmus among the child population, but also has other repercussions on the victims' health and productivity when they reach adulthood.

In view of these considerations, nutrition education has been accepted as an important supportive measure in all programmes for the promotion of maternal and child health.

In its report in 1950, the Joint FAO and WHO Expert Committee on Nutrition emphasized the importance of nutrition education as a nutrition promotion measure in health sectors. Education and training in nutrition have since gained importance in the programmes of both national and international organizations.

The Applied Nutrition Programme (ANP) during the 1960s was perhaps the first large scale effort to introduce nutrition education in community health programmes. In this programme, nutrition education for the promotion of desirable dietary practices was placed on an equal footing with the promotion of food production. Subsequently, the Special Nutrition Programme (SNP) and many other National Nutrition Programmes have included nutrition education in their inputs. Obviously, the success or failure of the education component depends on various specific factors, especially the inputs provided and the relative importance given to it by functionaries as well as beneficiaries.

Any nutrition education effort can successfully motivate the target and bring about desirable behavioural changes only if awareness of the problem and its consequences are created and practicable solutions suggested.

Institutional Approaches

Some of the studies carried out in different parts of the country on the impact of nutrition education on weaning foods may be briefly reviewed at this stage. The Poshak Project Study[2] has clearly shown that the nutritional status of preschool children is directly related to weaning factors.

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Attitude surveys conducted six months after the programmes of supplementary feeding and nutrition education revealed that mothers were able to identify and explain correctly what the food supplement was, and how it should be prepared. Also, an increased awareness of the need for feeding semi solid supplements to preschool children was reported. It was also claimed that these concepts had been actually put into practice by mothers.

The ICMR instituted in 1974 a multicentric study to develop suitable weaning foods and devise appropriate methods to evaluate and popularize them among communities[3] A supplementary feeding-cum-nutrition education programme covering 2450 children less than under 3 years old was designed to demonstrate the beneficial effects of supplementary feeding on the health of the children. A significantly lower prevalence of severe forms of protein energy malnutrition (PEM) was reported in the experimental areas as compared to control areas. The mothers' knowledge of, and attitude towards the need of weaning foods and their preparation was improved in some centres. One of the centres, however, reported a poor response despite periodical nutrition education sessions with mothers. This was attributed mainly to the fact that most mothers considered it economically more profitable to engage themselves in their usual occupations than bringing children to feeding centres. In general, the false beliefs of mothers were dispelled. Mothers who were initially reluctant to test recipes were found to be more receptive to them at the end of the surveys.

Before launching any nutrition education programme it is necessary to have adequate base line information on the socio-cultural aspects of infant feeding and weaning practices. Hanumantha Rao and his associates[4] studied the prevailing feeding habits in Telengana villages, and reported that mothers felt that breast milk is sufficient for children till about 1½ years of age, and that early feeding is not necessary. Only a few children received very insignificant supplements of animal milk. These children received rice and dal only after the age of one year. Mothers were given education for three months on various aspects of infant feeding.

In addition, cooking demonstrations were also held[5]. A distinct improvement in knowledge and attitudes of the mothers was found following a three month exposure to nutrition education. The study showed that nutrition education had a more sustained effect on the mothers approached individually at the family level. Lack of time and money was usually cited as the cause for the discontinuance of the newly introduced recipes.

A significant impact of domicillary education services on the nutrition awareness, attitude and practice was reported by Shah[6] among 500 mothers in Maharashtra. A year of exposure to nutrition education resulted in increased awareness regarding the early introduction of semi solid foods for the prevention of malnutrition among infants. Devadas et al.,[7] observed that nutrition education imparted through the Applied Nutrition Programme (ANP) resulted in a definite improvement in the attitude of the mothers, in the eating habits of children, and attendance at Balwadis. Incidence of clinical signs in preschool children was reported to have decreased compared to control groups.

In their study in 5 villages around Hyderabad, Rau, et al.[8], assessed the effect of a package of health activities, including nutrition education with and without supplementary feeding, on the concepts and practices of rural mothers. The results indicated that mothers at the end of 18 months in villages which had all the inputs showed significantly better awareness of dietary needs in PEM, early dietary supplementation and oral rehydration therapy. But this increased awareness and even easy availability of the supplements in the village did not result in the offtake of these supplements. The lack of purchasing power was the major constraint in the utilization of weaning foods. The authors concluded that nutrition awareness and/or availability of foods must also be accompanied by programmes of increasing purchasing power to put in action their renewed knowledge and attitudes.

Vijayaraghavan and his associates[9] have recently reported the results of an evaluation of nutrition education activities delivered as an integral part of a comprehensive health care programme under India Population Project (IPP) in Karnataka state. Improvement of knowledge regarding health and nutrition was observed in the community following nutrition education. But while there was an increased awareness after educational sessions concerning the need for supplements, particularly semi solid foods for 6 months old, only a small percentage of respondents put into practice what they had learnt. Similar observations have been reported in early studies carried out elsewhere by Krishnakumar et al[10]. Poverty and lack of resources have been reported as important constraints in practising the advice regarding supplementary foods.

However, in areas where supplementary feeding was coupled with nutrition education under this programme, beneficiaries were found to practice the dietary advice to a greater extent. The study suggests the linking of the nutrition education campaign with the supplementary feeding programme, which is required not only for the success of the feeding component, but also to modify the dietary practices in the desired direction.

The Role of Mass Media

The approaches to nutrition education described above are institutionalized. In nearly all these programmes, the education activities undertaken have relied on face-to face communication techniques dealing with small groups. There are some limitations in such an approach because of limited outreach. The target audience that requires such nutrition education in the lower socio-economic strata is large. In a country like India, there is the need of a large staff and this involves a big budget. With limited resources available in the country, the personal transfer of information to a large section of the population would be difficult, to say the least.

Mass media are invaluable in such circumstances. They enable the relatively simultaneous exposure of a large, scattered and heterogenous audience to stimuli transmitted by impersonal means. Films, newspapers, TV and Radio can be used effectively to communicate with large numbers of people. Messages can be structured according to requirements and message distortion is minimum. Impact studies carried out by Ramadasmurthy, et al., [11] [12] indicated that nutrition based broadcasts and telecasts (by SITE) had some shortcomings.

Surveys brought to light lapses in message construction and inadequate use of baseline data which hindered the possibility of an impact. Also, media in this case was not used innovatively. Since then, several useful recommendations have been made to increase the impact of telecasts.

Multimedia Exposure

Research in communication has shown that ideal impact is maximised by multimedia exposure. This means that more than one medium has to be used to reinforce a new concept or idea. In India, for example, language differences raise additional problems: there are 14 languages and a large number of dialects.

Certainly, mass media can create interest and awareness, specially if followed up by interpersonal communication. This would ensure opportunities for doubts to be cleared, and for the target to initiate behavioural changes. This calls for a functionary, preferably at the local level. Considering various aspects such as knowledge, practice, availability, coverage and acceptance by the community, it would appear that community health volunteers would be the ideal agents of change, by offering health and nutrition inputs to the community.

In a recent study carried out by the National Institute of Nutrition, it was found that the CHV's knowledge of breastfeeding and the introduction of supplements, was far better when compared to that of the community members, though this was not so in the matter of detecting nutritional disorders[13].

The studies cited above, highlight the need for community education in vital aspects of nutrition such as weaning. Such a programme is likely to succeed when institutional efforts are supported by the effective use of mass media, and followed up by peripheral workers.

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DEVELOPMENT OF SUITABLE AUDIO-VISUAL AIDS FOR DISSEMINATION OF INFORMATION ON WEANING PRACTICES

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Introduction

Poor infant feeding practices and their consequences number among the obstacles to social and economic development. The infant mortality rate in India is still very high - 125/1000 live births. Deaths during the period of weaning are 10-15 times higher in India than in the industrialized countries. The infant mortality rate depends on many factors. It is, therefore, imperative that several different measures be taken to reduce it. Experience has shown that better infant feeding practices can make an important contribution to the reduction of the infant mortality rate.

For the survival, health and development of infants, breast-feeding should be protected and encouraged and supplementary foods should be started at the age of 4-6 months. Faulty infant feeding practices can be corrected through nutrition education programmes. Such programmes are simple and can be carried out with minimal inputs. The strengthening of the nutrition education component in support of breast-feeding and of the improvement of weaning practices will require little additional expenditure for the families and the government.

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Need and Importance of Nutrition Education

That nutrition and health education is of crucial importance is amply illustrated by the links existing between ignorance, ill health and malnutrition. The need for such an education is naturally most urgent among the poorer sections. Successful nutrition and health education programmes mean improved health and better nutritional status for the vulnerable groups.

Child care should be the core of health and nutrition education. The objective of such an education should not be to impart knowledge alone, but to modify the traditional infant feeding practices. Appropriate audio-visual aids should be prepared keeping in mind the social, economic and cultural conditions of the people and their perceptions regarding infant feeding. Studies conducted in different parts of the country have revealed that the inadequate knowledge of mothers on supplementary foods, the superstitions about the nature and quantities of foods to be given to infants, and the age at which these should be started, lead to a high incidence of mortality, morbidity and malnutrition among children. The problem is compounded by poverty and by the unhygienic environment in which a large number of children are born.

The effectiveness of a programme on nutrition education depends upon the simplicity, the relevance and the specific nature of the messages. Advice to mothers regarding breast-feeding should begin in the pre-natal period. Nutrition education programmes should particularly involve mothers when their infants are between 4-6 months old.

This is a period when a child's growth begins to falter. unless appropriate supplementary foods are timely introduced. There is a growing awareness of the significant role of nutrition education in improving the nutritional status of vulnerable groups, especially infants and young children. However, there is still a lot to be done.

Nutrition Education in Existing Programmes

The Government has introduced several programmes for improving the nutritional status of the vulnerable sections of our population such as the Special Nutrition Programme, the Balwadi Nutrition Programme and the Mid-day Meal programme. These programmes provide supplementary nutrition to children and to pregnant and nursing mothers. The convergence of supportive health services with nutrition and health education can make these programmes effective in improving the health and nutritional status of the target population. The Integrated Child Development Services aim at the delivery of an integrated package of services, which include the health and nutrition education of women. Child care education is the core of health and nutrition education in ICDS.

Nutrition Education in ICDS

The following list of messages has been developed to be communicated by all the ICDS functionaries and their trainers in the course of Nutrition and Health Education (NHE).

1. Breast-feed as long as possible.

2. Introduce semi solid food from 5 to 6 months.

3. Feed young children between 3 to 6 times a day.

4. Do not reduce food in illness.

5. Use available health services.

6. Get children immunized.

7. Keep yourself and your surroundings clean; drink clean water.

8. Have no more than 2-3 children, two to three years apart.

An analysis of the Nutrition and Health component of the existing programmes shows that such component is very weak. The PEO Evaluation Report on the ICDS (1978) reveals that although 75 per cent of the women were aware of the nutrition and health services, only 19 per cent in fact availed of them. There were many reasons for the non-participation of women in the programme. These included the unsuitability of the timings, the uninteresting method of imparting nutrition education, its poor organization and the lack of suitable audio-visual aids. Women who are busy as wage earners neither have the time nor the motivation to attend sessions where education on nutrition is imparted.

Also it has been suggested that the AWW do not visit the women often enough to motivate them to participate in these programmes. The AWWs lack of adequate knowledge about infant feeding. The absence of communication skills in women organizers and a dearth of audio-visual aids to conduct programmes of nutrition education are some of the reasons that make the nutrition education programme little effective.

Proper supervision and adequate emphasis on nutrition and health education would help to overcome the shortcomings of the programmes.

Suggestions on Improving the NHE Component in ICDS

The communication component of training which includes the preparation and use of audio-visual aids for nutrition education and the continuing education of AWWs, MSs and CDPOs needs to be improved. There is an urgent need to prepare and make available suitable low cost audio-visual materials. The communities should also be oriented to the services provided by the ICDS. The NHE services should be provided at a more convenient time and should be modified and made interesting and conducive to participation. A multi-media mix approach including films and folk drama could be used. It is necessary to enable the AWW to spend sufficient time in conducting nutrition and health education. In order to improve the credibility of the worker as a person with knowledge and experience in maternal and child care, the AWW should preferably be a married woman with children.

The AWWs should give priority to teaching methods to families with moderately and severely malnourished children. With the help of suitable audio-visual aids, mothers should be given advice on weaning on the frequency of feeding young children and on the amount and type of food to be given. This can be done by the AWW during home visits, or when the mothers come for supplementary feeding to the Anganwadi centre. One effective method is to demonstrate to the mothers how to prepare the weaning food under hygienic conditions and how to feed the infant.

The AWW can use the growth chart as an important tool for nutrition education. She can explain the relationship between food intake and the growth curve. Since older children and grandmothers often take care of young children, the AWW should also impart NE to them. The AWW should be assisted by a trained dai in promoting breast-feeding and the introduction of supplementary foods.

Group approaches such as lecture-discussions at the anganwadi centres, functional literacy classes for mahila mandals can also be organized to disseminate information on infant feeding using appropriate aids. Special monthly meetings may be arranged to impart such information. The focus of these meetings should be the elaboration of basic nutrition messages. Films on infant feeding can be shown at such gathering, or local drama troupes invited to perform on the subject.

Training

There is growing concern that nutrition and health education imparted to the trainees in training institutes is vague, unclear, and unrealistic in content, and unimaginative in the preparation of audio-visual aids and communication techniques. Simple NHE materials, equipment and kits are usually not available in training institutes. A paucity of NHE materials, both at the training centres and at the field level, is common. Either trainers do not make use of the audio-visual aids prepared by other agencies like VHAI, CHEB, UNICEF, etc., or such aids are not available to them. It is clear that it would be far more logical and cost effective to ensure that the trainers are first educated and equipped to prepare NHE aids.

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Strengthening NHE Skills of Project Staff

A major limitation of NHE in ICDS is the lack of proper training of the AWW, the Supervisor and the CDPOs in communication techniques and the lack of audio-visual aids. Workshops could, therefore, be arranged to improve this aspect of the training. In such workshops, the trainees could design and prepare low cost indigenous nutrition education materials and through field work practice communication skills. In the process they could acquire first hand training in teaching mothers individually and in groups.

Training Materials

The NIPCCD has developed a training syllabus for all ICDS functionaries, of which NHE is a part. The syllabus for AWWs allocates 110 hours to nutrition and suggests extensive practical and field work. Of this 28 hours are allotted for organizing and conducting nutrition and health education and preparing audio-visual aids.

Similarly, sufficient emphasis has been given in the syllabi to the training of MS and CDPO in nutrition education. Although these functionaries do not directly conduct nutrition and health education, they have to guide and support the AWWs in this aspect. It is, therefore, essential that they are able to plan and prepare communication aids and to organize and conduct nutrition education effectively. Recently, parent and community education in ICDS has been included in the syllabi of different functionaries.

The NIPCCD has prepared a Guidebook for AWWs, a practical manual which can be used as a reference document by the AWWs after training. The Institute has also prepared a handbook for Nutrition Trainers of AWWs. This handbook outlines a number of innovative training methods and aids which can be used by the trainers. The Institute is also preparing a number of film slides on nutrition including a series on breast-feeding and weaning to be used for training purposes. The NIPCCD has also published a book of low-cost weaning recipes and general nutritious recipes.

Profile of Trainers

Nutrition trainers are trained professionals who come from different disciplines. In the absence of clear guidelines, the method and content of their training is geared towards their own professions. A common tendency is to rely heavily on technical information at the risk of neglecting the search for practical solutions to practical problems. In most cases, the nutrition trainers have no experience of the conditions under which the AWWs work. The NIPCCD has trained trainers focusing on innovative techniques and materials. Recently, it has conducted two workshops on participatory nutrition education methods, techniques and aids. One was held in March 1982 and the other in February 1983. Twentytwo trainers in nutrition from different states attended the first workshop and twentyeight trainers of CDPOs, Supervisors and AWWs attended the second workshop.

Nutrition Education Materials

A number of audio-visual aids such as, charts, posters, flash cards, flannelgraphs, songs, puppets, pamphlets, films and slides on breast-feeding, on infant feeding and on the preparation of low-cost weaning foods have been developed by different agencies. The Voluntary Health Association of India and the Central Health Education Bureau, have produced such nutrition education materials on a large scale and helped in their dissemination at a low cost. Agencies like the National Institute of Nutrition (Hyderabad), the National Institute of Health and Family Welfare, the National Institute of Public Co-operation and Child Development, the All India Institute of Hygiene and Public Health (Calcutta) and Voluntary Agencies such as the Gandhigram Institute of Hygiene and Public Health, the Child-in-Need Institute (Calcutta), the Literacy House (Lucknow), the Indian Academy of Paediatrics, the Christian Medical College (Vellore) and many others have produced nutrition education materials.

The next step is to collect, categorize, analyze, translate, reproduce and distribute this material at the field level.

Development of Audio-Visual Aids

Before preparing audio-visual aids to be used in any nutrition education programme for dissemination of information on weaning practices, it is important to have as much reference material as possible - such as local methods of infant feeding, the length of lactation, when foods are introduced, their nature and amount, the frequency of feeding and the traditional feeding habits.

NHE can also be an important responsibility of the mass media. The broadcasts on All India Radio on nutrition have already been found to be successful.

Due to the differences in socio-economic status, literacy level and occupational status existing among the target population, there is no single method or channel by which all groups can be effectively reached. Selective use of the mass media should be made to promote breast-feeding and establish correct infant and young child feeding practices.

Mass media channels will vary. They may also include the radio, TV, films, photo-features, folk media, advertisements and posters, newspapers and mass literature. The massive diffusion of transistor radios makes the radio an attractive and rewarding medium for programmes of social development. The feature film is a highly popular medium in India which can be effectively harnessed to provide mass exposure to nutrition messages.

Campaigns can be mounted using suitable audio-visual aids and the mass media to promote breast-feeding and adequate food supplements to the child after 4-6 months of life. The stark facts about illness and death among non breast-fed babies should be effectively communicated. Modern channels of communication can be associated with traditional cultural activities such as drama, puppet shows, festivals, etc., so that a bigger population is covered. While attempting these, care should be taken to ensure that correct, consistant and unambiguous messages are transmitted to the target groups.

Role of Various Agencies in Nutrition and Health Education

Central Health Education Bureau

The CHEB of MHFW is the primary institution for NHE in India. It has a media division for the production of printed material, slides, films, radio scripts and a demonstration division for the pretesting and evaluation of the materials.

The CHEB produces nutrition education materials - leaflets, pamphlets, brochures and posters. These are mainly produced by the Directorate of Advertising and Visual Publicity and then sent to the State Health Education Bureau (SHED) where they are translated into the local languages. Films are also conceived at CHEB, and later made into shorts, 2 to 3 minutes long by the Films Division. The CHEB itself which is a resource centre for audio-visual aids on nutrition education, can be further strengthened.

Ministry of Information and Broadcasting (MIB)

The MIB has a variety of resources which can be used in the dissemination of important nutrition messages:

AIR: This is a promising channel for disseminating information concerning health and nutrition. The MIB officials should be sensitized to Health and Nutrition Education. A detailed broadcast plan could be developed, specifying the information on infant feeding to be broadcast, the schedule and the timings of the broadcasting.

Films Division: Produces films on health and nutrition for GOI. Such films are dubbed in local languages when required and then distributed. Most of these films lack the regional variety needed in a multi cultural society. A number of good films can be produced in projects such as breast-feeding, timely introduction of supplementary foods, feeding of infants and of young children.

Division of Field Publicity

This Unit has 221 mobile units throughout the country which organize film shows and village entertainment. These units can be potential resources for the dissemination of important nutrition and health messages on breast-feeding and weaning.

DAVP: DAVP is responsible for the production of printed material on nutrition and health education.

Song and Drama Division: This division has 16 offices throughout India and utilizes live entertainment media to make the masses aware of the programmes objectives. Its potential has not been fully tapped.

Department of Food - Mobile Extension Units: The Mobile Extension Units of the Department of Food can play an important role in nutrition education. Such units can organize group demonstrations of low-cost nutritious weaning recipes and use audio-visual aids to deliver important messages on infant feeding.

Home Science Colleges: These colleges are potential resource centres for nutrition education. They should be consistently involved in the preparation of community nutrition programmes for monitoring the nutrition education component and of different audio-visual aids.

How to Improve Nutrition and Health Education

It has been amply demonstrated that the NHE component of the existing programmes is weak and that it needs to be improved and strengthened. A planning, management and co-ordination system should be set up at the national, state and district levels. The NHE unit at the national level should perform the following functions :

1. Plan well integrated national and regional NHE campaigns: (a) identifying different communication strategies, (b) mobilising the existing resources, (c) providing for new resources.

2. Supervise the NHE services to ensure implementation of the programme at different levels.

3. Disseminate nutrition education and training materials to the state: (a) collecting the existing NHE and training materials from all over the country, (b) reviewing and protesting the suitability of these materials, distributing prototype materials including films, radio scripts and other audio-visual aids.

The NHE unit can serve as a clearing house for NHE materials. The National NHE unit could work closely with MIB to get the AIR to allot time for messages on breast feeding and weaning and information on nutrition.

At the state level, the NHE unit could ensure that the NHE interventions are actually implemented. The unit will also be responsible for the collection, adoption, translation, mass production and distribution of NHE materials and programme ideas. The unit could co-ordinate with the state level and with public and private institutions working in NHE in order to harness all available resource and expertise. It could also work closely with mass education and media officers of Health and Family Welfare Departments.

The district level NHE unit should see that :

(a) monthly village level nutrition education meetings are held;
(b) field functionaries are involved in NHE and audio-visual aids are available at the field level;
(c) the monthly pay day meeting for field functionaries is utilized for continuous retraining in nutrition and health education.

Participatory Approach to Nutrition Education

Field staff tend to use the didactic approach with passive demonstration to impart nutrition concepts. These techniques fail to involve the learners.

Non-formal education which involves the learner's experience in analytical and creative ways, offers the advantage of promoting conceptual and attitudinal changes from "inside". It enables a critical reflection by the learners themselves, rather than limiting the process to a simple transfer of information.

The participatory technique means a change from a didactic oriented approach, where the teacher does most of the "talking", to an open experiential learner-centred approach. Here the beneficiaries themselves are fully involved in creative, analytic and planning activities.

The traditional approach to education identifies the teacher as the 'almighty' source of information and the students as passive 'receivers'. It is based on a single one-way transfer of information from the one who teaches to the one who is taught. Paulo Friere refers to this as the 'banking' concept of education where the information is deposited into an apparently empty receptacle.

The traditional approach is gradually giving way to an innovative participatory approach involving a reciprocal exchange of ideas between the facilitator and the learners. The facilitator guides the learners through the process of identification of their needs, assists them in the analysis of their problems, in the formulation of alternative solutions and in the ultimate choice of the course of action.

It is important that the facilitator familiarise himself with tne attitudes and practices prevalent in the community. Once he is acquainted with this background information, the chances of his being accepted as a part of the community are definitely enhanced.

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PRODUCTION OF WEANING FOODS SUITABLE FOR MASS PRODUCTION AND CONSUMPTION IN DEVELOPING COUNTRIES

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Introduction

It is well known that the growing infant requires a soft semi solid nutritious food supplement at the state of weaning from the mother's milk, and also upto 1½ - 2 years of age to promote normal growth. The economically affluent elite meets this requirement through commercial weaning foods which are technically standardized. Many such brands are popular in the market but expensive. For the large majority of the population who cannot afford these prohibitive prices, the choice as far as infant feeding is concerned, is limited. The baby either gets the same food which is prepared for the rest of the household or continues to be fed with mother's milk, with a suboptimal calorie intake. In either case, the nutrition of the child suffers and optimal growth cannot be assured There is, therefore, an urgent need for meeting such requirements through the development of nutritionally balanced weaning foods which are reasonably priced and which adapt themselves to preparation at home or at the community level. These foods should be manufactured using a variety of raw materials available in the household. The technology of preparation should also be simple, within the grasp of the common people, and make use of simplified machinery. The present paper deals with the efforts made at the Central Food Technological Research Institute (CFTRI), Mysore, for the development of weaning foods especially for those who do not belong to the high income strata.

Raw Materials

Raw materials for formulations should naturally be based on the bulk foods used in households, namely, the cereals and pulses the combination of which in the right proportion can ensure an adequate supply of good quality protein. This mixture can be supplemented with a little milk which is usually available in the house, and can also be supplemented with skim milk powder and/or other vitamins. The recent emphasis has been on weaning food of low bulk (i.e. low viscosity when cooked and calorie rich) so that for the unit volume of food the baby receives a high caloric intake. Also, the roughage in the formulated food should be minimal although it need not be excluded fully.

Processing

The above requirements seemed to be met by some traditional technologies which are commonly practised in Indian households. Such technologies could be adopted to prepare formulated weaning foods in a dry form. Techniques such as malting, puffing, flaking, chapati making and extrusion through the household vermicelli press were found to be adaptable to the making of weaning foods. A well balanced mixture of cereal and legume in the proportion of 3:1 is suitably processed, individually, or toegther, and combined to form the base mix for weaning foods which can be cooked with 4-5 parts of water to form a semi solid food for the infant.

The processes are simple, and the result is a nutritious mixture, which either retains the natural vitamins present in the ingredients, or makes a beneficial alternative during the processing so that nutrients are better available to the system.

For example, puffed cereals contain almost all the nutrients present in whole grains. Malting or germination hydrolyses the phytin, predigests the starch partially and produces a good aroma. Another great advantage of malting is the reduction in viscosity caused by the elaboration of amylases during the germination process, which helps in increasing the caloric density of the food.

Some of the relative merits and limitations of the different technologies for preparing weaning foods are as follows :

Malting

1. The process allows for the partial predigestion of starch and protein.

2. The viscosity can be reduced to any desired level depending on the extent of germination, making the process especially suitable for very young babies.

3. An attractive aroma is developed during the kilning process.

4. Phytase hydrolyses the phytin to available phosphate.

5. The elaboration of vitamin C and lysine is reported in many cereals.

6. A long processing time and adequate sun drying or other mechanical drying facilities, are required.

7. Debranning of the cereal or legume can be assured after the germination process.

Chapati Process

1. This process can be applied to any composite milk based on cereals, legumes, millets, etc.

2. Highly acceptable products are obtained with sorghum based and wheat based formulations.

3. The normal process of chapati making already practised at home can easily be extended.

4. Moisture can be reduced by sun drying, toasting at low heat, or by drying in an air current.

5. The process is easily applicable in households, particularly in non-rice areas where chapati making is common.

6. The product has high viscosity.

Vermicelli Process

1. The process allows full cooking and gelatinization of the constituents.

2. The process causes the least damage to nutritive value.

3. The product has high viscosity.

4. A high moisture content is required for extrusion with a hand press.

5. A long drying time is required.

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Puffing by High-temperature, Short-time Roasting

1. This is basically a dry-condition process.

2. It can be practised even in areas where humid and rainy weather prevails for most of the year.

3. Puffing is achieved by roasting in hot medium (salt or sand for less than one minute).

4. The formulation has a very low moisture content and can be preserved for a long period.

5. The viscosity of the product is high.

6. The process is particularly suitable for formulations based on sorghum, bajra, ragi, bengal gram and green gram.

7. A fine aroma is developed during puffing.,

8. It does not permit the removal of bran, particularly from the cereal component.

9. It is more suitable for foods for older children.

High-temperature, Short-time Roasting and Flaking

1. This process is best suited to rice based weaning food, as flaking is practised both commercially and in households.

2. It allows the mother to buy flakes and roasted legumes from the market and formulate her own mixture for baby feeding through a simple mixing of ingredients.

3. The roasting develops an attractive aroma and can bring moisture to a low level.

4. No drying facilities are required.

5. The product has high viscosity.

6. There is a possibility of damage to lysine during the roasting.

Each of these methods has some specific merits that make it suitable for particular localities or situations. The protein content and PER of formulations typical for each method are given in Table-I. Supplementation with 5 per cent skim milk solids and necessary vitamins and minerals, could increase the nutritive value of weaning foods and make them nutritionally complete.

When the formulation is made at home where skim milk solids may not be available, small amounts of fresh liquid milk available in the household can supplement a weaning food made only of grains. Seventyfive grams of these foods would supply the infant with about 300 calories. These weaning foods may be made for one quarter of the cost of conventionally prepared weaning foods.

When stirred with water and boiled, the viscosities of the formulated weaning foods were however, variable, depending on the raw materials used and the processing methods employed (Table-I). The lowest viscosities were found in the case of malted weaning foods. Even in these, those cereals with high amylase levels (ragi and bajra) resulted in products with very low viscosities. Weaning foods made by the other processes exhibited high viscosity, which may be a disadvantage in assuring an adequate caloric intake by infants. Supplementation of such foods with about 20 per cent malted ragi powder, or even 5 per cent barley malt powder can reduce viscosity to the desired level.

Is is clear from the above, that there is a wide choice not only of raw materials for formulation but also of technologies for manufacturing weaning foods that might be especially suitable for use in the developing world. Depending on requirements, operating capacity, and the corresponding degree of mechanization, the processes can also be varied to suit local conditions. Decentralized production and regional marketing may reduce overheads to a minimum. It would be useful to set up the pilot production of weaning foods using each of the different processes so that the experience gained may be made use of by all developing countries.

These formulations have been tested on babies and their acceptance without side or secondary reactions has been established. Some of them have been compared with commercial brands of weaning foods and have been found to have a comparable growth promoting value for the baby. For instance, the formula based on malted ragi and green gram has been tested on 6 month old babies in hospitals under controlled feeding conditions, and found to have a nutritive value similar to that of commercial weaning food. The same formula has been fed to a large number of babies in child institutions and labour creches in industrial establishments and found to be popular and well accepted. The formula based on rice flakes and puffed Bengal gram or processed soya bean flour has been found to be well tolerated by babies. Puffed bajra and Bengal gram mixtures are also well tolerated. The advantage of a small amount of malt, as has been mentioned earlier, is the consequent decrease of viscosity.

The formulations discussed adapt themselves to preparation at home, community or factory levels. Commercial production is possible to meet the needs of community programmes where large quantities of weaning foods may be required. The special advantage in these traditional technologies listed above is that there is an element of choice in the raw materials used depending upon local availability, and also on the type of technology used, so that regional tastes and preferences can be taken into account in the production of the weaning food.

TABLE - I

Viscosity and Protein Value of Weaning Foods

Weaning Food	Protein content %	PER	Hot-paste Viscosity of 15% Slurry (cP*)	
			Plain	With added malt
Malted Weaning Foods**				
Ragi	12.1	2.43	60	-
Sorghum	14.6	-	900	-
Maize	15.1	-	450	-
Pearl Millet	15.5	-	60	-
Wheat	15.6	-	60	-
Chapaties***				
Wheat	15.4	2.69	6,000	96
Sorghum	13.2	2.60	3,800	108
Maize	12.5	2.71	2,000	42
Flakes				
Rice (70)+Soya(30)	17.5	2.81	1,700	42
Rice+ Green Gram + Puffed Bengal Gram***	16.9	2.72	1,800	56
Vermicelli				
Sorghum + Green Gram + Puffed Bengal Gram	13.0	2.64	4,200	100

* cP = centipoise, cgs unit of viscosity.

** Malted cereal and green gram in a ratio of 70:30

*** Cereal, green gram, and puffed Bengal gram in a proportion of 70:20:10

THE ROLE OF THE READY-TO-EAT PROCESSED FOOD FACTORY, HYDERABAD, IN THE IMPLEMENTATION OF GOVERNMENT NUTRITION PROGRAMMES IN ANDHRA PRADESH

Dr. Mallikharjuna Rao

Ready-to-Eat Factory, Hyderabad

Introduction

The Ready-to-eat Processed Food Factory was set up with the help of CARE, the Government of India and the Government of Andhra Pradesh in 1976, to provide Mid-day Meals in the form of protein enriched sev to nearly 3 lakhs of school going children in the districts of Mahaboobnagar, Medak, Ranga Reddy and Nalgonda, and in the twin cities in Andhra Pradesh. The objective was to prevent protein calorie malnutrition among the school going children of the region.

In 1980, UNICEF subsidized a plant for the production of nutritious food for the beneficiaries of the Special Nutrition Programme and the Integrated Child Development Scheme. The plant, worth about 2 million dollars and 90% of the equipment, were imported from Switzerland, Germany and the United States of America. The factory is managed by the Andhra Pradesh Nutrition Council with the Chief Secretary to the Government as the Chairman.

The Process

CARE Assisted Plant : the process involved in the CARE Assisted Plant is cold extrusion followed by deep-fat frying. CARE Plant ran till recently using as

principal raw materials corn, soya, milk powder and soya oil provided by CARE. The Government of Andhra Pradesh provides financial support for spices and condiments, for packing materials, and for overheads and distribution. CARE has gradually phased out its supplies, paving the way for the indigenisation of the entire programme.

UNICEF Assisted Project : this plant was designed to use various indigenous agricultural produced cereals such as rice and wheat, pulses such as bengal gram and green gram, and oil seeds such as soyabeans. Oil seeds, edible groundnut flour and defat soya flour are also used in this plant.

The UNICEF assisted project consists of three sections - preprocessing, processing and pulverising. The process involved is the cleaning of the grains or seeds, and the removal of stones, decortication and grinding. The ground materials are mixed in adequate proportions alongwith the required spices and condiments, and subjected to the process of extrusion and drying. Edible oil is sprayed on the product coming out of the dryer, to improve the palatability, and also to increase the calorie value. The product is packed in polypropline bags which are lined with polythene. The polythene liner is sealed and the outer liner is machine stitched.

To produce weaning food, the extruded food is converted into powder with the help of a pulveriser and mixed with 20% sugar, 5% milk powder, vitamins and minerals.

Products

The deepfat fried product (sev) is produced by the CARE assisted project for school going children under the Mid-day Meals Programme of the Government of Andhra Pradesh.

Two types of products are produced in the UNICEF assisted project. One is a high protein snack, the other one is a weaning food, both are for supply to the beneficiaries under SNP and ICDS.

Nutritive Value: 100 grams of product contains

Product	Protein calories	Fat	Vitamins
A. Weaning food	15 grams: 390 - 400	1 gm.	Fortified with Vit. A, B_1, B_2, Niacin and Ferrous Sulphate.
B. Extruded food (Snack Food)	15 grams: 415 - 420	5 gm.	Fortified with Vitamins and Minerals.
C. Sev (Muruku)	15 grams: 500	25 gm.	Fortified with Vitamins and Minerals.

Cost Of The Product:

	Product	Cost Per Kg.
A.	Weaning Food	Rs.6.00
B.	Extruded Food (Snack food)	Rs.5.00
C.	Sev (Muruku)	Rs.9.00

Ration Of Products:

A. Weaning Food - 50 gm. for child per day (children between 6 months and 2 years).

B. Extruded Food- 65 gm. for child per day (children between 3-6 years).

-110 gm. for adults (lactating mothers and pregnant women).

C. Sev (Muruku) - 60 gm. for child per day.

Distribution

Table I provides the details of the present coverage of beneficiaries. Table II provides the details of the places of coverage of the beneficiaries.

From 1980 onwards, about 1300 tons of weaning food have been produced under the aegis of the UNICEF assisted

plant. The present estimated production per month is of about 150 tons of weaning food and of about 10,000 tons of extruder food.

Future Loans

There are several programmes of diversification on hand. Among these are projects to produce energy food, chikki, vitaminised rusk and poha foods. The factory is shortly to produce a Threptin type of biscuit by converting weaning food, for the child beneficiaries in the age group of two years.

Conclusion

There is a great need for the production of extruder based weaning food to cover all the needy child beneficiaries in Andhra Pradesh. A number of units set up to produce weaning food at district levels would go a long way in meeting this urgent need.

TABLE - I

Present Coverage Of Beneficiaries

Programme	No. Of Beneficiaries			
	6 months to 2 years	3 years to 6 years	Adults	Total
1. MCH U.C.D.	5,498	35,576	480	41,554
2. 16 Municipalities	23,508	44,520	16,260	84,288
3. 14 Regular ICDS Centres	41,102	91,288	28,693	1,61,083
4. S.N.P Tribal	--	17,080	4,454	21,534
5. Drought 30 Municipalities	67,229	1,43,705	27,334	2,38,268
6. Hyderabad (Urban) ICDS	4,429	6,043	3,062	13,534
	1,41,766	3,38,212	80,283	5,60,261

TABLE - II

Places & Districts Where RTE Food Is Supplied

U.C.D M.C.H Hyd.	Municipalities	*ICDS Projects	**Tribal Blocks	***30 Drought Municipalities
	Place	District		
1. Charminar Circle I	1. Ananthpur	Ananthapur		
2. Charminar Circle II	2. Chittoor	Chittoor		
3. Musheerabad Circle III & IV	3. Cuddapah	Cuddapah		
4. Khairatabad Circles IV & V	4. Kakinada	Kakinada		
5. Secunderabad	5. Guntur	Guntur		
	6. Tenali	Guntur		
	7. Khammam	Khammam		
	8. Adoni	Kurnool		
	9. Machilipatnam	Krishna		
	10. Mahabubnagar	Mahabubnagar		
	11. Nellore	Nellore		
	12. Ongole	Prakasam		
	13. Nizamabad	Nizamabad		
	14. Vijayanagaram	Vijayanagaram		
	15. Warangal	Warangal		
	16. Eluru	W. Godavari		
	17. MCH, Twincities			

Table - II (Continued)

Places & Districts Where RTE Food Is Supplied

	*ICDS Projects	
	Place	District
1.	Utnoor	Adilabad
2.	Kambadur	Ananthapur
3.	Kurnool	Kurnool
4.	Vijayawada	Krishna
5.	Narsapur	Medak
6.	Visakhapatnam	Visakhapatnam
7.	Boath	Adilabad
8.	Gazwel	Medak
9.	Mothukur	Nalgonda
10.	Banswada	Nizamabad
11.	Marpally	Ranga Reddy
12.	Domakonda	Nizamabad
13.	Nagarkurnool	Mahboobnagar
14.	Ramayanpet	Medak
15.	Hyderabad	Hyderabad
16.	(Urban) ICDS	

Table II - (Continued)

Places & Districts Where RTE Is Supplied

**Tribal Blocks

(A)	R.R. District	(B)	Medak District
1.	Chavella	1.	Medchal
2.	Pargi	2.	Gajwel
3.	Vikarabad	3.	Siddipet
4.	Tandur	4.	Medak
5.	Maddur	5.	Narsapur
6.	Rajendranagar	6.	Patancheur
7.	Maheswaram	7.	Jogipet
8.	Ibrahimpatnam	8.	Narayankhed
9.	Marpally	9.	Zaheerabad

(C)	Nalgonda District	(D)	Mahabubnagar District
1.	Alair	1.	Amangal
2.	Bhongir	2.	Kalwakurthy
3.	Thungathurthy	3.	Atchampet
4.	Suryapet	4.	Nagarkurnool
5.	Kodad	5.	Kollapur
6.	Huzurnagar	6.	Shadnagar
7.	Ramannapet	7.	Jadcherla
8.	Munugonda	8.	Mahabubnagar
9.	Nalgonda	9.	Bijinepally
10.	Nakrekal	10.	Vanaparthy
11.	Chintapally	11.	Gadwal
12.	Devarkonda	12.	Alampur
13.	Miryalguda		

Table - II (Continued)

Places & Districts Where RTE Food Is Supplied

***30 Drought Municipalities covered under Drought Relief Programme		
	Place	District
1.	Hindupur	Ananthapur
2.	Rayadurgh	Ananthapur
3.	Guntakal	Ananthapur
4.	Tadapatri	Ananthapur
5.	Dharmavaram	Ananthapur
6.	Kadiri	Ananthapur
7.	Tirupati	Chittoor
8.	Madanapalli	Chittoor
9.	Srikalahasti	Chittoor
10.	Proddutoor	Cuddapah
11.	Jagitial	Karimnagar
12.	Nandyal	Kurnool
13.	Yemmiganoor	Kurnool
14.	Gadwal	Mahboobnagar
15.	Narayanpet	Mahboobnagar
16.	Medak	Medak
17.	Zaheerabad	Medak
18.	Sangareddy	Medak
19.	Sadasivapet	Medak
20.	Siddipet	Medak
21.	Nalgonda	Nalgonda
22.	Bhongir	Nalgonda
23.	Suryapet	Nalgonda
24.	Kavali	Nellore
25.	Markapur	Prakasam
26.	Tandur	Ranga Reddy
27.	Anakapalli	Visakapatnam
28.	Bheemunipatnam	Visakapatnam
29.	Jangaon	Warangal
30	Gudur	Nellora

WEANING PRACTICES IN NORTHERN STATES OF INDIA

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Introduction

Weaning practices in the northern states of India are influenced by the adult diet pattern and the literacy level of mothers. In most of the northern states, between 40 to 50 per cent of the mothers seem to introduce animal milk, reconstituted milk or tea as the first additional food. A large number of infants are fed with diluted milk. With an increase in education and income, supplementation is advanced. The urban population introduces supplements earlier than the rural one. This indicates that availability of foods in the urban area encourages earlier supplementation. Information on the type of supplements introduced in several parts of north India shows similar features in urban areas, whereas, in rural and tribal areas family food is modified to suit the infant. Information available on the weaning practices in Delhi, Agra, Chandigarh, Varanasi, Bhopal, Jaipur, Jammu and Himachal Pradesh is summarised in the following pages.

Age At Which Weaning is Started

A survey of infants and preschool children in Jammu revealed that 42.4 per cent of urban and 15.9 per cent of rural infants were receiving supplements even before the age of 3 months; 62.5 per cent or urban and 42.4 per cent of rural were receiving supplementary food between 3 and 5 months. The survey also reports that the difference between urban and rural children, in terms of age at which supplementary milk feeds are begun, is negligible - (Table-I).

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TABLE - I

Frequency Distribution of Infants Fed On Supplementary Milk At Jammu

Age of starting supplementary milk feeds	Urban (%)	Rural (%)
Below 3 months	65.0	57.6
3 - 6 months	25.0	18.9
6 - 9 months	5.0	5.3
9 - 12 months	5.0	13.5
12 - 18 months	-	4.1
18 - 24 months	-	0.6

Dharam et al. (1977)

In urban communities in the Union Territory of Delhi, 47.4 per cent of the infants were reported to receive top feeds between 1 and 3 months (Table - II).

TABLE - II

Age At Introduction of Top Feeds, In An Urban Community at Delhi

Age in Months	%
1	16.6
1 - 3	30.8
4 - 6	13.8
7 - 12	15.7
13 - 18	9.7
19 - 24	40.0
24	2.5

Shanti Ghosh et al. (1976)

A survey attempting to study the weaning practices of mothers belonging to different socio-economic levels in general and the education level in Chandigarh in particular, has revealed that matriculated mothers and mothers belonging to higher income groups introduced supplementary foods at an earlier age than others who are less educated and who belong to low income groups (Table-III and IV).

TABLE - III

Influence of Mother's Education on the Age of Introduction of Supplements In Chandigarh

Mother's education	Less than 6 months	6-9 months	10-12 months	13 and above months
Graduate	32.65	24.49	32.65	8.16
Above matric but below graduates	26.18	16.67	28.57	28.57
Matric and below	7.93	4.76	34.90	49.22
Literates	7.38	7.38	27.00	58.19
Illeterates	2.70	1.35	33.78	62.16

Walia et al. (1974)

TABLE - IV

Influence of Income on the Introduction of Supplements in Chandigarh

Socio-economic Status	Less than 6 months	6-9 months	10-12 months	13 and months
Upper class	58.33	16.67	25.00	-
Upper middle class	34.28	25.71	25.71	8.57
Middle class	8.00	14.00	31.00	46.00
Lower middle class	10.71	4.28	36.40	48.60
Poor class	1.59	1.59	22.22	74.60

Walia et al. (1974)

Recent studies covering 400 rural families in the hilly villages of Himachal Pradesh, have shown that supplementary foods are given, starting from the age of 3 months.

In Varanasi district 66.7 per cent of children in the urban group were weaned before 6 months of age. The corresponding figure for urban slum and rural groups were 40.14 per cent and 33.6 per cent respectively.

Age at Which Semi Solids and Solids are Introduced

In Jammu, a high percentage of urban children were introduced to solid foods at an earlier age (Table-V) than rural children.

TABLE - V

Age of Introduction of Solids in Urban and Rural Areas of Jammu

Distribution of children according to age when solids were introduced	Urban	Rural
Before 6 months	15.6	2.4
Before 9 months	35.0	22.6
Before 12 months	51.2	36.9
Before 18 months	86.5	74.6
Before 24 months	98.3	92.6
After 24 months	1.7	7.4

Dharam et al. (1976)

In Aligarh, educated mothers were found introducing solid and semi solid supplements at an earlier age, than illiterate mothers (Table - VI).

TABLE - VI

Influence of Maternal Education at the Time of Introduction of Solids and Semi Solids in Aligarh

Age in Months	No. of cases	Educational Status		
		High School and above	Upto High school	Illiterate
1 - 3	1	1	-	-
3 - 6	5	5	-	-
6 - 9	14	7	7	-
9 - 12	9	-	7	2
Total::	29	13	14	2

Jaiswal et al. (1981)

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A study carried out in Delhi also revealed that 33 per cent of postgraduate mothers, 60.3 per cent of graduate mothers and only 29.4 per cent of illiterate mothers, began semi solids before 10 months of age. Solids were reported to have been introduced between 13-18 months of age. The birth order of the child seems to have a positive influence on the age at which solids are introduced in urban children, but this is not so among the rural population of Jammu (Table → VII).

TABLE - VII

Age of Introduction of Solids in Relation to Birth Order of the Child

Birth Order	Before 8 months	Before 9 months	Before 12 months	Before 18 months	Before 24 months	After 24 months
URBAN						
1st	33.8	48.1	61.7	90.3	96.3	3.7
2nd	17.4	41.5	55.9	88.2	97.4	2.6
3rd and beyond	8.3	27.5	45.1	84.4	99.4	0.6
RURAL						
1st	0.8	17.2	31.1	79.3	87.9	12.1
2nd	3.3	19.3	32.7	76.0	92.0	8.0
3rd and beyond	2.4	27.2	44.6	70.2	96.4	3.6

Dharam et al. (1977)

In Bhopal, solids were first introduced by most mothers only at the age of 12 months.

At Varanasi, 19 per cent of the children in the urban group were given semi solids and solids before the age of 6 months. In urban slums and among rural groups, the same were introduced at a much later age. Fifty to 55 per cent of the urban children received semi solids and solids between 7 - 12 months of age, and most rural and urban slum children received the same between 13 - 18 months.

Type of Weaning Foods Introduced at Different Stages

The most common supplementary food given to infants is top milk. Weaning is begun mainly with buffalo or cow's milk.

TABLE - VIII

Type of Supplementary Milk Given by Mothers at Bhopal

Cow's milk	31.7%
Buffalo's milk	35.82%
Goat's milk	11.56%
Dairy Milk or tea with milk	10.0%

Bhandari et al. (1973)

TABLE - IX

Type of Supplementary Milk Given by Mothers at Rewa

Cow's milk	56.0%
Buffalo's milk	14.8%
Goat's milk	6.0%
Mixed milk	19.8%
Powdered milk	3.3%

Gurudeva et al. (1982)

TABLE - X

Type of Top Feed Given to Children in an Urban Community at Delhi

Buffalo's milk	42.0%
Cow;s milk	6.7%
Powdered milk	17.3%
Toned milk	14.0%

Shanti Ghosh et al. (1976)

Among the tribals of Himachal Pradesh, diluted buffalo or cow's milk was given to most of the children, since undiluted milk was considered a heavy food.

In one of the recent studies conducted in Aligarh, it was found that literate mothers used proper feeding bottles and the correct dilution of milk, whereas illiterate ones used discarded bottles easily available at home; also the dilution was not correct. Table-XI indicates the influence of maternal education and of the surroundings on the degree of dilution of top milk.

TABLE - XI

The Influence of Maternal Education and Place of Dwelling on the Degree of Dilution of Top Milk in Aligarh

Nature of Dilution	No. of	Educational Status			Place	
		High School and above	Upto High School	Illiterate	Urban	Rural
Conc. formula	5	4	1	-	5	-
Undiluted on isocaloric formula.	3	3	-	-	3	-
DILUTED MILK						
1 : 1	27	1	14	12	22	5
1 : 2	9	-	-	9	7	2
1 : 3	1	-	-	1	-	1

Jaiswal et al. (1981)

Shanti Gosh et al. (1976) also found in their study that an increased level of maternal literacy favours a decrease in the dilution of top milk for infant feeding. In another study at Rewa it was found that the ration of top milk to water ranged from 3:1 to 1:1. The common belief prevalent in that area is that undiluted top milk is not easily or well digested.

At Jaipur, it was found that liquids such as milk, butter milk and rabdi were used as supplementary foods for a large number of children (42.3 per cent). Semi solids including kichdi, dalia and dal were given as supplementary food to 18.2 per cent of the children and solids such as roti and biscuits were fed to 23.3 per cent of the children.

The supplementary foods given to children in Himachal Pradesh were found to be laphi and lugra both considered nutritious by mothers. 'Laphi' is prepared by boiling roasted wheat flour in water and then adding salt and ghee. The other way of preparing laphi is by adding milk and sugar to roasted wheat flour. 'Lugra' is prepared by boiling rice in water and then adding milk and sugar. Chapatis are not given to children below the age of one because most mothers feel that the child will not be able to chew them. Tea is the main ancillary beverage given as early as at the age of one month to 28.5 per cent of the children and at the age of 3 months to 81.8 per cent.

Salty tea prepared by adding butter, salt and dry fruits to boiled tea is the main ancillary beverage among the tribal inhabitants of Himachal Pradesh.

Sathu and chullilaphi were introduced as semi solids to all children in the tribal area of Himachal Pradesh. Chulilaphi is made of one variety of dried apricot, which is soaked in water overnight. After it is boiled, sathu, salt, spices and oil or ghee are added to it. Sathu, dal, potatoes, vegetables, rice and chulliphi are con sidered easily digestable. Chapatis and boiled rice are not given to the child frequently as they are not eaten by the family everyday.

Common food supplements used in Varanasi among urban, rural and urban slum dwellers were sago, rice with dal, mashed potatoes and green vegetables. Egg, suji, rice and curd were more frequently used in the urban group. Children of the urban group were given an adult diet by 12 - 18 months of age but in rural and urban slums, an adult diet was introduced only after 24 months. One common practice in urban slum and rural areas was that certain food items such as cereals, meat, curd, brinjal, jack fruit and root vegetables, were not given to infants because they are believed to cause liver disorders and distension of the abdomen. One the other hand, 83.6 per cent of urban infants were provided whatever they could eat.

Although no special weaning food was identified in Jammu, it was found that the type of solids used for weaning were dependent on the age of the infants. Farex or bananas mashed into a semi solid consistency, were used at the age of 3 - 6 months. Biscuits or bread were fed between 6 - 9 months, and kichdi, rice, dal or chapati, beyond the age of 9 months.

The earlier introduction of solids was in relation to both socio-economic status as well as maternal literacy. Ancillary beverages consisted of gripe water and a local dicoction (a dicoction of two or more of the following varying proportions: cardamom, black salt, carraway, cinnamon, anisi, nutmeg, clove, asafoetida).

In Delhi, mothers of a higher socio-economic bracket follow a pattern of gradual weaning. At the age of 6-8 months, they introduce mashed foods of a gruel like consistency such as sujikheer (suji, milk, sugar), mashed potatoes and bananas; at the age of one year, they introduce kichdi, dalia, boiled vegetables and chapatis. It was observed on the other hand that in many families from poor communities, the mother begins initial feeding with chapati after a year, and usually at irregular intervals.

In Bhopal, it was found that cereal is not fed in the form of gruels, but in the form of chapatis, boiled rice, biscuits, etc. There is however, inadequate information on the frequency, regularity and quantity of supplements given to infants.

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RECOMMENDATIONS

Breast-feeding

Nursing mothers should be given nutritional supplementation with energy rich food, containing vitamins and minerals and counselled on the importance of breast-feeding.

Complementary foods introduced at early age of childhood should not become substitutes to breast milk, but should become supplements to it.

Weaning Period

There is evidence that supplementation of infants during the first six months of life does not result in significant weight gain. Moreover, since supplementation during this period has to be necessarily either liquid or semi solid, it carries the risk of over dilution and contamination of the feeds. For this reason, the most appropriate period for starting supplementation to breast-fed infants is around six months. However, breast-feeding should not be interrupted.

In urban areas, particularly among working women, the mean duration of the lactation period has been found to be around 4 to 5 months. Whenever earlier supplementation is needed, it should be advised only after having ensured proper hygienic conditions.

Weaning Food

The complementary foods should be of high energy content and enriched with vitamins and minerals to fill up the calorie protein gap.

Complementary food given preferably between breast-feeding should be such that it can be easily prepared and used by anyone other than the mother for feeding a number of times.

The regular family diet should be adapted to suit the needs of the very young child. Suitable adaptation techniques should be developed and disseminated among the community.

Since feeding with freshly prepared meal eaten by adults may not be possible more than twice daily, production of RTE (Ready-to-Eat) and RTM (Ready-to-Mix) foods which can be easily reconstituted should be encouraged.

Proper acceptability trials should be carried out on well fed children before launching a project for RTE/RTM distribution in a community.

Flours prepared with a blend of partially malted and roasted grain and roasted pulses fortified with vitamins and minerals should be made available through the public distribution system. A variety of supplementary foods should be produced to avoid monotony.

Local people, especially women of under privileged sections organized in bodies like Women's Club and Mahila Mandals should be involved in the production of suitable foods e.g., biscuits for infants and young children. Locally available resources should be used in the production of such supplementary foods and necessary technical and financial assistance should be provided. A plant should be established in each District or Block for large scale production of these foods.

Production

An adequate number of food processing plants to produce fully and semi processed complementary foods should be installed in each state to meet the needs of the Integrated Child Development Services Scheme, the Special Nutrition Programme and other child care programmes.

The private sector should be encouraged to produce complementary food by being given incentives and/or by removing disincentives such as, excise duty, sales tax, etc.

Nutrition Education and Awareness

A group of experts (from the Home Science College, the National Institute of Nutrition, the Food and Nutrition Board, etc.,) should be formed to identify the most appropriate messages in the area of weaning and infant feeding. The group should develop the content, methodology and aids for extending these messages through field functionaries, irrespective of the department.

Nutrition education material used by various field functionaries working in different departments (Health, Agriculture, Education, Social Welfare) should be collected and the techniques used, analyzed.

The opinion forming groups like, general practitioners, paediatricians, local leaders, administrators, policy makers, peripheral workers should be involved in the promotion of appropriate weaning practices and in popularizing weaning foods produced at home and at the community level.

Infant feeding practices should be an integral part of the course content in training activities of agriculture, health and social welfare sectors.

Education programmes should give more emphasis to foods to be given to children during illness.

Modern advertising techniques should be adopted for spreading nutrition and health education and supplementary feeding messages.

There should be co-operation between professionals and advertising agencies in the preparation of material for mass media, for promoting home/local processing of supplementary foods with locally available food materials.

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COMMUNITY HEALTH CELL
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Breast feed as a long as possible.

Introduce semi-solid food from 6 months.

Feed young children 3 to 6 times a day.

Do not reduce food in illness.

Use available health services.

Immunize your child.

Keep the family and your surroundings clean.

Drink clean water.

Weigh your child and watch the growth.

WORKSHOP ON WEANING FOODS

A REPORT